NATURE MAGAZINE

bruary, 1943 35 Cents Vol. 36, No. 2

Keep a Year's Issues of NATURE MAGAZINE in this Handsome Binder

"Where's the latest copy of Nature Magazine?" How often you have heard that question! And how often an answer like this: "Look on the chair . . . over in the corner!" Like as not, the much desired copy will turn up under the cushion in the window seat. And great will be the lament at torn pages and creased pictures.

Unlike most magazines, Nature Magazine is the sort you want to keep. Naturally issues accumulate. There's an easy solution to the problem of mislaid copies, unsightly disorganized piles of magazines. Get one of these binders specially prepared for Nature Magazine.

Just slip in the copies of Nature Magazine as they arrive. Snap them in with the little unbreakable hooked wire. This binding device while light is strong and sturdy, guaranteed to withstand all ordinary usage. The copies may be removed as easily as they are inserted. At the end of the year, remove the year's copies and have them bound. Your binder is then ready to serve another year, accommodating each issue as it arrives.

Always Protected and Right at Hand

This binder looks and handles like a book. It is a bound book in every respect except that you snap the magazines in the cover one at a time. It opens flat as a bound book, which makes it easy to handle and to read. It keeps the magazines handy for a year—or as long as you wish to retain them in the binder. Meanwhile the contents are protected from handling, tearing and from being mislaid or carried away. The binder is finely grained, dark green, gold embossed . . . a handsome addition to desk or library.

← Opens Flat like a book

This De Luxe Binder only $2

Send for your binder today before this copy of your magazine gets mislaid. We are so sure you will like this binder that we guarantee to refund your money if you are not entirely satisfied. Use the coupon here or, if you prefer, write us your order so as to avoid cutting the magazine.

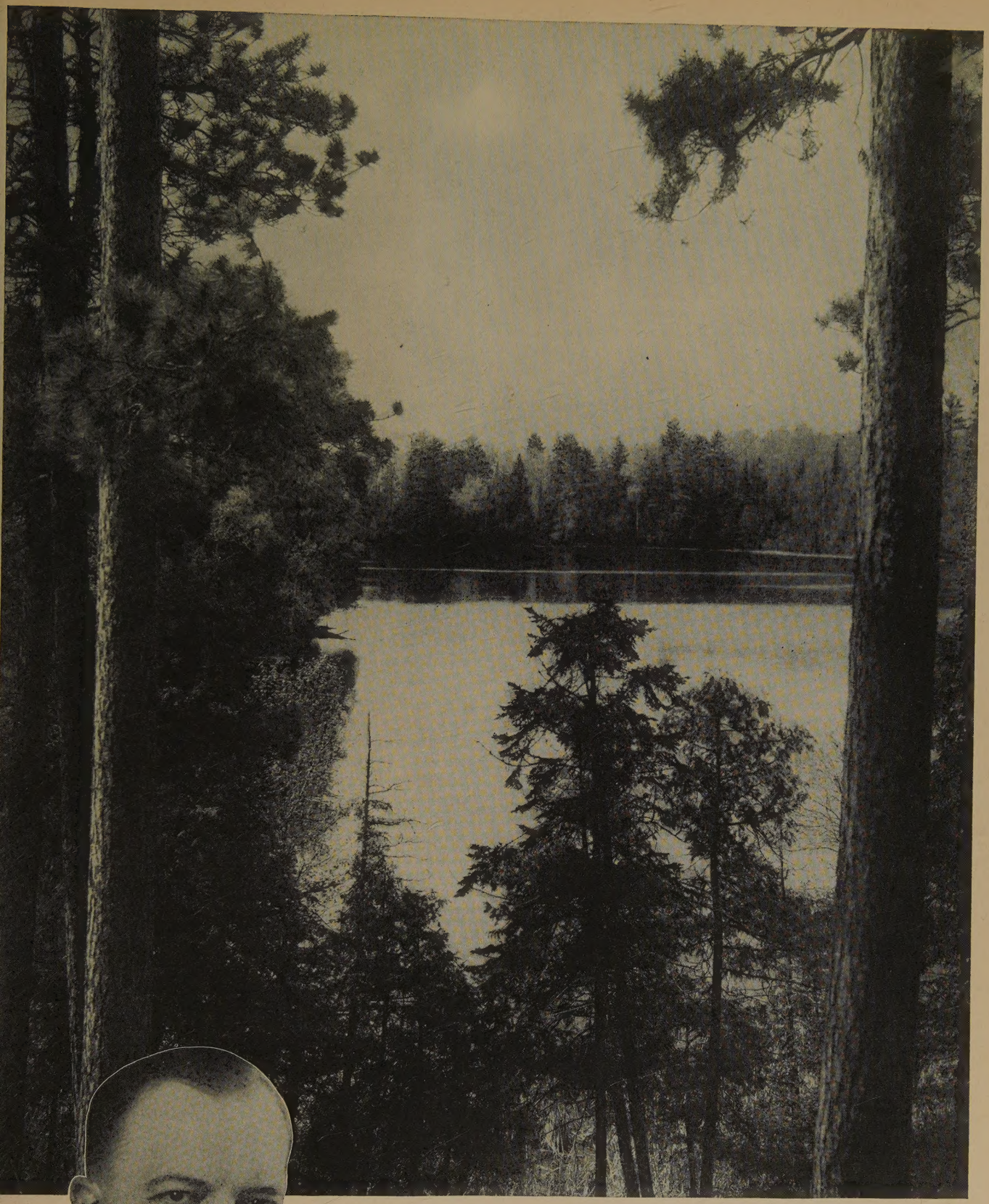
AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W.
Washington, D. C.

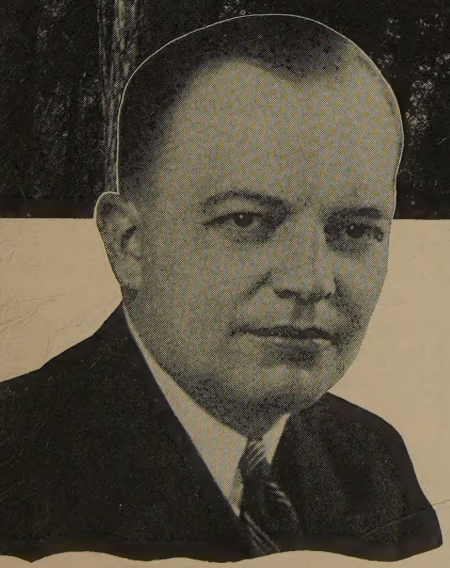
Send me_____of your De Luxe Binders for NATURE MAGAZINE, for which I enclose (check, P. O. Money Order) for $_____

*Name*_____

*Street and No.*_____

*City and State*_____





Says GOVERNOR HAROLD E. STASSEN *of* MINNESOTA:

"Our mines are furnishing vast quantities of iron ore. Our forests are contributing much needed lumber. Our farms are supplying the vital dairy products, meats and grains for the war effort. Our Land of 10,000 Lakes extends a welcome as ever to those who have the opportunity this summer to come to Minnesota, and renew their energy for war work, in the beautiful, natural surroundings with which our state has been so lavishly endowed."

Send for "Travel Guide Book of Minnesota"— Address: Dept. N43

MINNESOTA TOURIST BUREAU

STATE CAPITOL » » » » » » » SAINT PAUL, MINNESOTA

Camera Trails

By NORRIS W. HARKNESS

Snow Pictures

Because of the time required for the editorial work on and physical production of NATURE MAGAZINE, Camera Trails has to be written at least six weeks before you find it in your mail box. The result is that I sit at the typewriter on a cold, snowy day in February and try to imagine how grand the air smells on one of the first spring days when the April issue has arrived, or swelter in that hot week New York always endures in September and write about the crisp wind and the lovely colors of early November. But this time I can look out the window and watch the season's first real snow storm and talk about it at the same time.

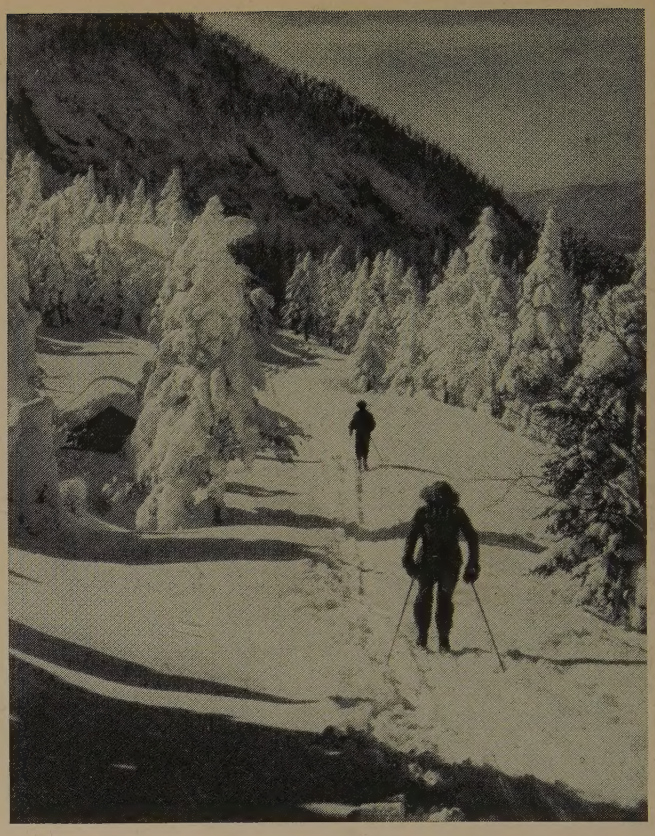
Snow pictures are in one sense the easiest to make in black and white because they are black and white to begin with, and we can see in the scene just about what will appear in the finished print without having to remember that certain colors will be darker or brighter than they seem to the eye. Technically, they offer only one real difficulty—the extreme range of contrast between the brilliant highlights and the dark tree trunks or other areas not covered with snow. The other trouble, their flatness in the wrong light, can be easily overcome by side lighting, but the contrast needs careful exposure calculation.

Usually a snow scene requires about half the exposure that same scene would need in the same light but without any white blanket. With the sun approximately at right angles to the direction of the lens, I have found 1/100th of a second at f/11 quite generally satisfactory when the light was bright and the shadow detail was not too important, but one stop more is likely to be needed when the dark areas are the picture. That is based on Plus X film developed in Defender 777 after exposure through a medium yellow filter.

The filter is quite important to give the snow more texture. The white snow reflects much of the blue light from the sky—the cause of the blueness you see in the shadows in color shots—and reducing the amount of the blue that gets to the film emphasizes the shadows and keeps the snow from seeming a uniform white. The tiny depressions that make up texture show better as the effect of the filter increases, and a red one will darken them just as it does the blue sky.

A medium yellow filter is enough for any ordinary work, but a lenshood is necessary to keep the light reflected from outside the picture area from striking the lens and dulling the brilliance of the negative, and a small stop to get everything sharp will usually be best. Those accessories are sufficient, but watch the exposure, and, if the scene is worth it, shoot several pictures at different apertures or shutter speeds to be certain one is just right.

All this applies to straight landscapes or to Nature pictures, but it leaves out the most important factor, the subject matter and the composition. Do not waste film on any shot until you have looked it over carefully enough to be sure you will want to keep and to show the print after it is made. Check the arrangement trying to see it on paper and not in reality, squinting a little as you look to see the masses rather than the complete detail of each object. Check each fact at your command and then make each camera adjustment



SKI TRAIL by Gustav Anderson. Note the splendid combination of excellent technique in the purely photographic sense with the addition of human interest to the scene.

after a definite decision and with a considered reason for each setting. Try to make each picture tell a story, whether it is a Nature story or the expression of a feeling brought out by your impression of the scene itself, and the impression it makes on you. Try to get in your shot just what most affects you as you see it.

In processing avoid too much development of the negative, and then make the best possible print using test strips to find the best exposure and the best grade of paper. Tone it slightly blue if you wish, but don't carry the toning too far. Then you will have a Picture!

This and That

As this is written no new restrictions have been announced by the War Production Board, but the supplies of film and paper as well as all equipment made of strategic materials are gradually decreasing in dealers' stocks. The requirements of the military are taking a great proportion of the goods still being manufactured, and all of those that are necessary war materials, and we in civilian life are getting as much as can be spared for us. That calls for the most careful use of the equipment and materials we have, and a consequent checking of all our methods from the opening of the camera straight through each step of the process to the mounting of the finished print. Go over your camera technique and your developing and printing to see if each part of the process is being done correctly and let me help with your problem if you wish. Keep your camera in action but conserve materials by using them to get the best from them.

Spotone, the new spotting dye, eliminates the troubles you have been having in removing those little white spots on your prints. It is not a paint that lies

on the surface of the emulsion but a dye that penetrates into the image and becomes part of it. Even glossy prints can be spotted so well that the areas done cannot be found, and the job is done more easily and more rapidly than with the old material. If your dealer does not carry Spotone, write Willoughby's Inc., 110 West 32nd Street, New York, for information on it.

If you have a movie projector, you have a fine tool for the education and amusement of your friends, but as you probably know from experience, another showing of the films you have shot of your own family will not be as interesting as it was the first time. To get around that difficulty you can show rented or purchased films that are the equal of those now being exhibited in your local theaters. In fact the newsreels available now in either 8 or 16mm film are often still being shown in the theaters when the producers of the home movies have them ready for us. Castle Films, a leading producer of home motion picture films, has a big catalog of films from the latest newsreels to animated cartoons. They also are distributing at cost a number of government training films for the use of the armed forces and workers on the production front. The catalog may be obtained from Castle Films, 30 Rockefeller Plaza, New York City, if you mention NATURE MAGAZINE.

Do not forget to save film spools —those with metal centers but not the wooden ones—film pack containers, and all metal film containers of every kind. Save them and then take them to your dealer who will return them to the right manufacturer to be reused for new material. The greatest shortage in photographic materials lies in the field of metals and the makers must have our scrap containers to keep on supplying us with films.

If you have a picture you would like to see reproduced in Camera Trails, send it in. This is your camera section of NATURE MAGAZINE and we would prefer to use your pictures. In the event that the editors feel your shot cannot be used, I will try to explain why. Please enclose return postage.

Camera Trails is conducted for the help it may be to Nature photographers, and operates a question and answer service to aid you to solve your photographic problems.

RATIONAL DEFENSE of your well being!

For sunshine and real rest or for all the golf, fishing, bathing, or gay evening diversion you can pack in, come to Sarasota, smart resort of Florida's West Coast—to The Sarasota's Terrace, foremost of Sarasota's RESORT hotels. Outstanding for food and service. First class in every respect.

Moderate rates. Booklet—write

TIMOTHY M. HALL, *Manager*

HOTEL SARASOTA TERRACE

SARASOTA, FLORIDA

A COLLIER FLORIDA HOTEL—GEORGE H. MASON, PRESIDENT

NATURE MAGAZINE

PUBLISHED BY THE AMERICAN NATURE ASSOCIATION

To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

IN THIS ISSUE

February, 1943 ..... Vol. 36, No. 2

Cover Design ..... Rosalie Rees
Camera Trails ..... Norris W. Harkness 58
Contents Noted ..... R. W. W. 63
The Best Things in Life (Poem) Prudence Winterrowd Douglas 64
Dilemmas of the Wild ..... Archibald Rutledge 65
Prophets (Poem) ..... Lalia Mitchell Thornton 68
Porcupines of the Shell World Carroll Lane Fenton 69
Growing the Painted Trillium .. Edwin F. Steffek 69
Beachcomber's Bonanza ..... Samuel Hudson 70
Cascara Goes to War ..... Leonard Wiley 73
Grasshopper Pets in China Mabel Irene Huggins 76
Humble Backyard Neighbors .. Ellsworth Jaeger 78
Nature in Print ..... Howard Zahniser 80
Hello! Do You Hear Me? E. Laurence Palmer 81–88
History Repeats ..... Arthur Newton Pack 89
A Boy's Birthright (Poem) .... Fleta Bruer Gonso 89
The Porcupine (Song) ..... Grace Keir 90
Ogres of the Prairie ..... H. H. Pittman 91
Victory Gardeners Make History Andrew S. Wing 93
Button, Button, What's the Bird? Talbott E. Clarke 96
November Nova Fades Away .. Isabel M. Lewis 98
Companionship (Poem) ..... Oscar Ostlund 99
Rukupi, Rare Rodent ..... W. G. Eigsti 100
The School Page ..... E. Laurence Palmer 102
Under the Microscope .... Julian D. Corrington 110

NATURE MAGAZINE, PAST AND PRESENT, IS INDEXED IN THE READER'S GUIDE IN YOUR PUBLIC LIBRARY

U. S. AND CANADA
ONE YEAR $3
FOREIGN .. $.75 EXTRA
TWO YEARS $5
LIFE $100

A. B. McClanahan, Advertising Manager

ADVERTISING OFFICES

New York—295 Madison Avenue
Washington—1214 16th St., N.W.
Chicago—203 N. Wabash Avenue
Philadelphia—323-325 Weightman Bldg.
Atlanta—Walton Building
Los Angeles—Western Pacific Building
San Francisco—Mills Building
Minneapolis—233 Radisson Hotel

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3rd, 1917, and February 28th, 1925. Additional entry at Greenwich, Conn. $3.00 a year; foreign $3.75.

Publication and Editorial Office, 1214 16th Street, N.W., Washington, D. C. Additional Office of Publication, Greenwich, Conn.

Copyright, 1943, by American Nature Association. Title Registered U. S. Patent Office. Printed in the United States.

THE ASSOCIATION

ARTHUR NEWTON PACK ..... President
Abiquiu, N. M.

RANDOLPH G. PACK ..... Vice-President
Darien, Conn.

RICHARD W. WESTWOOD ..... Secretary
Washington, D. C.

JAMES A. O'HEARN ..... Treasurer
South Orange, N. J.

HARRY E. RADCLIFFE ..... Business Manager
Washington, D. C.

DR. E. LAURENCE PALMER ..... Director, Nature Education
Cornell University, New York

THE MAGAZINE

RICHARD W. WESTWOOD ..... Editor
EDWARD A. PREBLE ..... Associate Editor
JULIAN D. CORRINGTON ..... Microscopy Editor
NORRIS W. HARKNESS ..... Photography Editor
ISABEL M. LEWIS ..... Astronomy Editor
E. LAURENCE PALMER ..... School Editor
ANDREW S. WING ..... Garden Editor
HOWARD ZAHNISER ..... Literary Editor
R. BRUCE HORSFALL ..... Artist
HARRY E. RADCLIFFE ..... Business Manager

SCIENTIFIC CONSULTING BOARD

DR. LELAND O. HOWARD
Retired Chief, U. S. Bureau of Entomology

DR. WALDO L. SCHMITT
Curator of Marine Invertebrates, U. S. National Museum

DR. HARRY C. OBERHOLSER
Cleveland Museum of Natural History

W. L. McATEE
Technical Adviser, U. S. Fish and Wildlife Service

C. W. GILMORE
Curator of Vertebrate Paleontology, U. S. National Museum

DR. PAUL BARTSCH
Curator of Mollusks, U. S. National Museum

DR. EDGAR T. WHERRY
Wild Flower Preservation Society

DR. WILLIAM M. MANN
Director, National Zoological Park

Which of These 39 Best-Sellers

ORIGINALLY PUBLISHED AT PRICES UP TO $5

Do You Want—Only $1 each?

FINELY-PRINTED, handsomely-bound new editions of modern best-sellers of fiction, biography, adventure, history, art, music, science, drama, and other fascinating subjects. These are not small or expurgated editions. They are full library size, bound in quality cloths and contain the exact texts, printed from the original, first edition plates. Many are lavishly illustrated with photographs and drawings. Truly remarkable values at only $1 each! Select the ones you want and order on the coupon below.

136. GETTING ALONG WITH PEOPLE—*Milton Wright.* How to improve business and social relationships. Sparklingly illustrated with anecdotes. Formerly $2.50.

92. STANDARD BOOK OF FORMULAS—*H. Bennett.* Make what you use—save money! Over 2,000 tested formulas: tooth powders, hair tonics, mouth washes, creams, polishes, etc. No scientific knowledge or equipment necessary. Formerly $2.

35. NEW BOOK OF ETIQUETTE—*Lillian Eichler.* Completely revised and brought up-to-date. 508 pages fully indexed. Etiquette for dinners, dances, engagements, weddings, parties, etc. Formerly $4.

20. STORY OF PHILOSOPHY—*Will Durant.* America's most famous modern book—the epoch-making history of humans as great thinkers, from Socrates to John Dewey. Formerly $5.

100. MARIE ANTOINETTE—*Stefan Zweig.* Amazing story of queen whose life ended on guillotine. Formerly $3.50.

95. POEMS IN PRAISE OF PRACTICALLY NOTHING—*Samuel Hoffenstein.* Over 100,000 copies sold. Dorothy Parker says: "Were I to be cast alone on a desert island, here would be the book I should wish to have along with me."

46. THE STORY OF MANKIND—*Hendrik W. van Loon,* author of "The Arts." An animated chronology of man's progress. 188 illus. Formerly $5.

88. NAPOLEON—*Emil Ludwig.* The supreme biography of most thrilling figure in modern history. Formerly $3.

174. THE BUSINESS ENCYCLOPEDIA—Edited by *Henry Marshall.* Covers all business subjects—banking, law, letter writing, arithmetic, advertising, selling, business English, credits, collections, etc. Formerly $5.

27. HISTORY AND DESTINY OF THE JEWS—*Josef Kastein.* Should be read by Jew and Gentile. Formerly $3.50.

172. THE ROMANCE OF LEONARDO DA VINCI—*Dmitri Merejkowski.* Proclaimed greatest novel ever written of Renaissance and its strange genius who painted *Mona Lisa, The Last Supper.* Formerly $5.

25. CLEOPATRA—*Emil Ludwig.* The world's bewitching, glamorous, talented queen—the woman, lover, mother, warrior. Formerly $3.50.

865. SAM SNEAD'S QUICK WAY TO BETTER GOLF—A *natural* **for all golf enthusiasts. Shows how to help yourself—with enlarged photographs of every movement, explained in brief, simple captions. No theories—but the 247 action photographs teach you to hit the ball the easy, natural way. This new kind of book is perfect for home study.**

34. GREAT SYMPHONIES: How to Recognize and Remember Them—*Sigmund Spaeth.* New, easy way to increase enjoyment and appreciation of good music.

181. THE BARBARY COAST—*Herbert Asbury.* The sink-hole of vice that made San Francisco's underworld the most dangerous spot in America. Formerly $3.

107. THE FRENCH QUARTER—*Herbert Asbury.* New Orleans in its notorious hey-day—an informal, infamous, infectious history by author of "The Barbary Coast." Formerly $3.50.

85. GENGHIS KHAN—*Harold Lamb.* Half the known world trembled before his thundering hordes. Formerly $3.50.

124. STRATEGY IN HANDLING PEOPLE—By *Webb and Morgan.* "Key" methods used by successful men to sway others, win friends, gain ambitions. Formerly $3.

84. WITH LAWRENCE IN ARABIA—Lowell Thomas. Exciting adventures with most mysterious figure of modern times. Formerly $4.

30. HOW TO WRITE LETTERS—*M. O. Crowther.* Complete, correct guide to personal and business letter writing. Formerly $2.

B35. COUNTRY EDITOR—*Henry Beetle Hough.* A rich, salty personal narrative of 20 years spent as editor of a delightful and unusual weekly newspaper on Martha's Vineyard near Cape Cod. Orig. $3.

B58. THE DOCTOR AND HIS PATIENTS—*Arthur E. Hertzler, M.D.,* author of *The Horse and Buggy Doctor.* Out of half a century of experience, this Kansas doctor has developed his own theories about maladjustments and the intimate needs of men and women, women's struggle for emancipation, war, and religion. In a frank, wise and vigorous volume, he shares the results of this experience with his readers. Orig. $2.75.

920. THIS LAND IS OURS—*Louis Zara.* To know the characters in this rich historical novel is to understand the things for which our nation fights today. Orig. $2.75.

753. THE SAINT TWO IN ONE—*Leslie Charteris.* 3 exciting novelettes and 9 swift short stories about the Robin Hood of modern crime. Orig. 2 volumes—*The Ace of Knaves* and *The Happy Highwayman.* Was $4.00.

760. MARRIAGE IS A PRIVATE AFFAIR—*Judith Kelly.* Forthright and mature novel of a modern marriage and a wife who tried to find happiness by experimenting with inflammable human relationships. A Harper Prize Novel. Was $2.50.

58. EATING FOR VICTORY: *Ida Bailey Allen's Money-Saving Cook Book.* 1300 recipes; nutritionally balanced menus. This unique cook book will show you how to meet rising food prices, prepare delicious, nutritious foods at budget cost, get the necessary vitamin and mineral content in your meals.

715. ABOVE SUSPICION—*Helen MacInnes.* Brilliant, exciting first novel of babes-in-the-wood against the Gestapo, hailed by critics everywhere. "Has just about everything."—*Boston Herald.* Orig. $2.50.

872. PIED PIPER—*Nevil Shute.* A rare and moving novel of a 70-year-old Englishman and the children of many nationalities that he led to safety through the wreckage of occupied France. The story on which the new movie starring Monty Woolley is based. Orig. $2.50.

56. A SMATTERING OF IGNORANCE—*Oscar Levant.* Hilarious best-seller by the mad-cap wit of "Information, Please". "A wise-cracking, fire-crackling, musical semi-autobiography."—Lewis Gannett. Orig. $2.

786. AMERICAN JIU-JITSU—*Edward L. Allen.* Shows exactly how a man or woman can render an attacker helpless—even if he has a knife, club or gun! 328 progressive action photos explain every step clearly. Large format, paper-bound. Just published.

B59. SECOND AMERICAN HISTORY QUIZ BOOK—*Edward Boykin.* Authoritatively compiled by the originator and conductor of radio's famous Americana Quiz Program. Will give you hundreds of little-known sidelights on our nation's history and heroes. Brand new.

B69. SECRET AND URGENT—The Story of Codes and Ciphers—*Fletcher Pratt.* Fascinating facts which reveal the methods of secret agents in modern war. A brilliant book by a master of codes. Orig. $3.75.

139. HAMMOND'S NEW COMBINATION SELF-REVISING WORLD ATLAS AND WORLD WAR MAP. Brand new, up-to-date, comprehensive. Contains latest full-color maps of all the world including new and special maps of all the battle areas. Contains separate world war map, 44"x32" in full color, suitable for wall use. An Amazing Double Value.

99. YOUNG MAN OF CARACAS—*T. R. Ybarra.* Delightful South American "Life with Father"—the story of a hot-blooded military Venezuelan father, a Boston-bred mother, and the dictators, dowagers, lovely ladies and resplendent officers in their lives. Orig. $3.

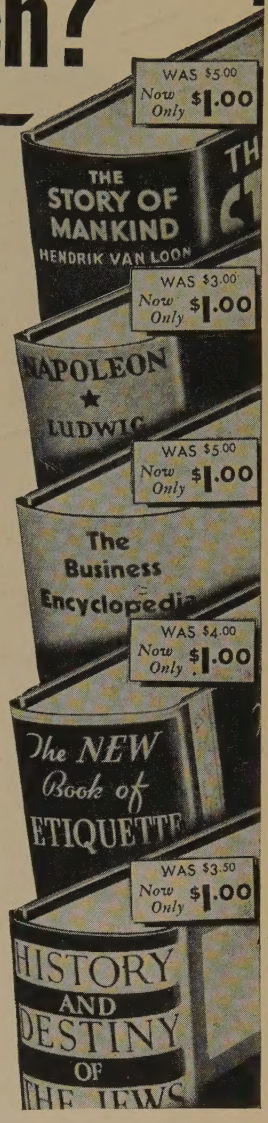
188. POPULAR QUOTATIONS FOR ALL USES—Ed. by *Lewis Copeland.* More than 1,000 quotations from the world's great writings and utterances arranged and indexed for instant reference. The perfect source book for all speakers and writers—a necessary reference for every home.

77. ART OF ENJOYING MUSIC—*Sigmund Spaeth.* Simple guide to understanding and appreciation of all kinds of music. Will be enjoyed by the concert-goer and by everyone who listens to good music on the radio or on records.

619. WHAT MAKES SAMMY RUN?—*Budd Schulberg.* Swift-paced, savage story of Sammy Glick, the man with a positive genius for being a heel, who went from New York's East Side to Hollywood's top ranks. Orig. $2.50.

110. THE CROSS WORD PUZZLE OMNIBUS—*Buranelli, Hartswick & Petherbridge.* Here are 149 crackerjack puzzles—hours of superlative entertainment for cross word fans.

645. SHELTER—*Marguerite Steen,* author of *The Sun Is My Undoing.* Powerful, dramatic best-seller, hailed as one of the finest novels to come out of this war. Orig. $2.50.



Mail Coupon

Simply encircle the numbers of books you wish on coupon below, fill in and mail. Send no money. On delivery deposit with postman amount due, plus few cents postage. If you are not satisfied that these are some of the greatest book values you ever saw, just return the books within 5 days and your money will be refunded. Mail coupon *today*—many titles are limited!

NATURE MAGAZINE, 1214 Sixteenth Street, N.W., Washington, D. C.

Please send me the books whose numbers I have encircled below. On delivery I will deposit with postman amount due, plus few cents postage. But it is understood that, if I am not entirely satisfied, I may return the books within 5 days and my money will be refunded.

20 25 27 30 34 35 B35 46 56 58 B58
B59 B69 77 84 85 88 92 95 99 100 107
110 124 136 139 172 174 181 188 619 645
715 753 760 786 865 872 920

Name .....

Address .....

City ..... State .....

( ) Check here if enclosing amount due. WE pay postage. Same money back guarantee applies, of course.

Telephone wire coming up

Here's a bomber-gunner hurrying to load his 50-calibre gun. . . .

In peace, a lot of that copper would have gone into new telephone lines. Now it's needed for shooting and winning the war.

That's why we can't build new lines right now. That's why we're saying —"Please don't place Long Distance calls to war-busy centers unless it's absolutely necessary."

Thanks for all your help and we hope you will keep remembering.

BELL TELEPHONE SYSTEM

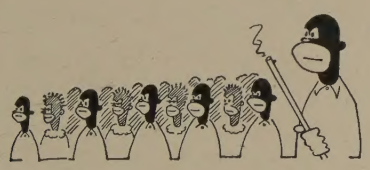
WAR CALLS COME FIRST

COPYRIGHT ARMY AIR FORCES AID SOCIETY

Contents Noted

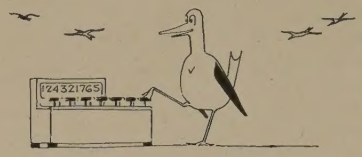
No medals were handed out, but the British Ministry of Agriculture recently gratefully cited the army of insect-eating birds that put in long hours last summer in protecting British crops and making a magnificent harvest possible. Protective laws have increased Britain's insectivorous birds to record numbers. One ornithologist estimates that 16,000,000 blackbirds, 15,000,000 starlings (yes, starlings), 15,000,000 swallows, 12,000,000 wrens and 11,000,000 robins spent the summer eating up insect enemies of England's crops and fruit. In Wales alone, there are estimated to be 900,000 song thrushes, which fed their young 3,800,000,000 assorted insects and 210,000,000 slugs and snails every day. American boys with BB guns, people who let their cats go wild and hungry, and others who thoughtlessly or maliciously contribute to the destruction of American insect-eaters may take these figures to heart when figuring up how far their ration cards will go.

Although the completest use of the feathers, hides, fats and other valuable by-products of the birds and mammals shot as game is essential in these times, we are disturbed by the increasing emphasis in some quarters on using our wildlife as a source of food. However, the exception that proves the rule seems to have turned up in Alabama where a game warden arrested a Negro for shooting in one county with the resident license of another county. Brought before the justice of the peace, the defendant testified to having thirty-six living children. He was freed.

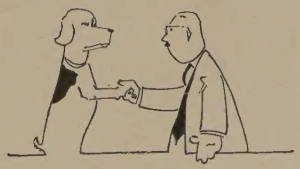


Our recent comment on highway fatalities to wildlife has brought in interesting letters. A South Norwalk, Connecticut, reader who used to drive extensively—B. G. R.—observes that the careless disregard of motorists for wildlife has disturbed him for some time. On one long trip he took the trouble to count dead and maimed animals, finding 1009 victims of thirty-nine species, thirteen of which were birds. He watched an Arizona driver deliberately speed his car so he could run down a road runner, the State bird. During a cold spell in Florida, wintering white-breasted swallows were huddled in masses in bayberry bushes and on the ground. Two hundred or more shivered in a compact mass on the grass shoulder of a main highway. Into this mass one motorist drove deliberately. The victims, which our correspondent gathered and to which he gave fitting burial, filled a six-quart basket.

We hear glowing reports of tremendous increases in migratory waterfowl, including such silly assertions as that a present estimated 100,000,000 ducks and geese has brought the birds back to the estimated numbers of the turn of the century. Yet an early December report from the California Division of Fish and Game records poor to very bad shooting in most areas on the California fly-way. Larger flights are reported from Illinois on the central route of the south-bound birds. Eastern reports are spotty and varied. All of which seems to indicate a still none too perfect knowledge of the details of the migratory waterfowl come-back, particularly as to the recovery of the species most reduced in numbers.



Two or three readers have seen in the short note under the heading "Dog Food Problem" in our December issue an enmity on our part toward man's best friend. Certainly none was intended, and we are, in fact, all for Fido. The only thought in the note was to emphasize that extermination of any species in our fauna, or destructive exploitation and commercialization of any wild species as food for pets should not be permitted. Other solutions to the problem exist.

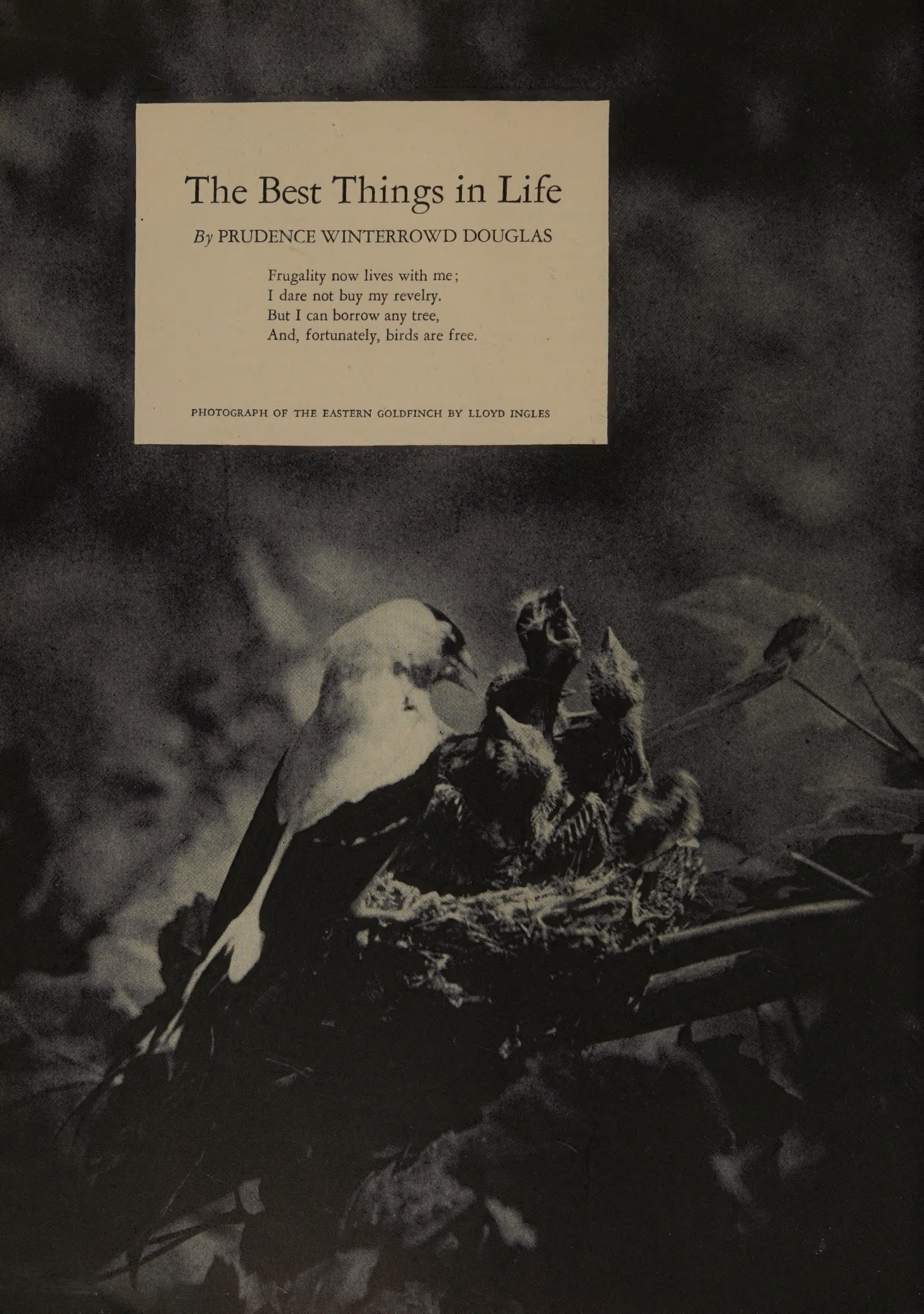


Wrapping air into tiny cellulose packages, hooked together like a string of transparent beads, the Dupont chemists have produced a highly-buoyant material. This is being tested as a substitute for kapok and sponge rubber in life jackets and rafts and for bridge pontoons, as well as for insulation in cold-weather jackets and flying suits. There might be some risk of getting these mixed with your vitamin capsules, although probably only hiccoughs would result. R. W. W.

The Best Things in Life

By PRUDENCE WINTERROWD DOUGLAS

Frugality now lives with me;
I dare not buy my revelry.
But I can borrow any tree,
And, fortunately, birds are free.



PHOTOGRAPH OF THE EASTERN GOLDFINCH BY LLOYD INGLES

In dangerous predicaments, forest creatures usually pop up with the right answers to—

Dilemmas of the Wild

By ARCHIBALD RUTLEDGE

FEW aspects of Nature are more fascinating than the amazing ability of wild creatures to escape peril. When their lives or those of their young are threatened they show not only high intelligence and wiliness, but sometimes display a spiritual quality comparable to human valor.

I once saw a female duck hawk defending her two fledglings against the depredations of a falconer who was bent on stealing the young birds. This hawk had a nest half-way down the face of a precipitous cliff; to reach it the falconer had lowered himself by a rope. When I arrived on the scene he was dangling in mid-air just above the nest. The mother hawk was dashing at his eyes with beak and talons, and the man drew his pistol and fired blank cartridges at the bird. To protect her fledglings on the rocky shelf below, the mother bird courageously disregarded the pistol shots, and continued her furious attack. But finally she realized that the falconer was not to be frightened away, and that her young would be taken if they remained in their nest and within the reach of the intruder.

Faced by this tragedy, the mother hawk made an instantaneous decision. She flew to the limb of a pine tree about thirty feet across the gorge and uttered a distress signal that evidently told her young ones that they must fly to her or be captured. One fledgling was too afraid or too weak to attempt the perilous flight, and consequently fell prey to the falconer, but the other responded at once to her call and, flapping precariously on its untested baby wings, flew across the chasm to his mother's side—and safety.

A wild creature in a tight spot always asks itself, "What's safest to do now?" And instinct answers with the life-saving artifice that is most likely to succeed. A bird or animal caught flatfooted by an enemy, unable to hide, and unwilling to resort to combat until all other possibilities of escape have been exhausted, will often feign ferocity or madness, or simulate death. An assumption of ferocity or other antic behavior perhaps suggests hydrophobia, which animals know and fear. At any rate, these frightening postures usually delay an enemy's attack, and may even frighten the foe away.

PHOTOGRAPH BY H. ARMSTRONG ROBERTS

". . . the egret seemed to be anchored where it stood."

The more harmless a creature is, the more defenseless he is; therefore in a crisis he is likely to imitate one that is highly dangerous. Innocuous snakes will vibrate their tails like rattlers. The innocent puff adder inflates himself fearsomely until he is almost twice his natural size, and blows in a manner terrifying to the uninitiated. This serpent can put on the most convincing and appalling of all dying acts, and appears to reach dissolution only after a gruesome pantomime of suffering. The opossum feigns death convincingly—his eyes even roll back, and his mouth falls open.

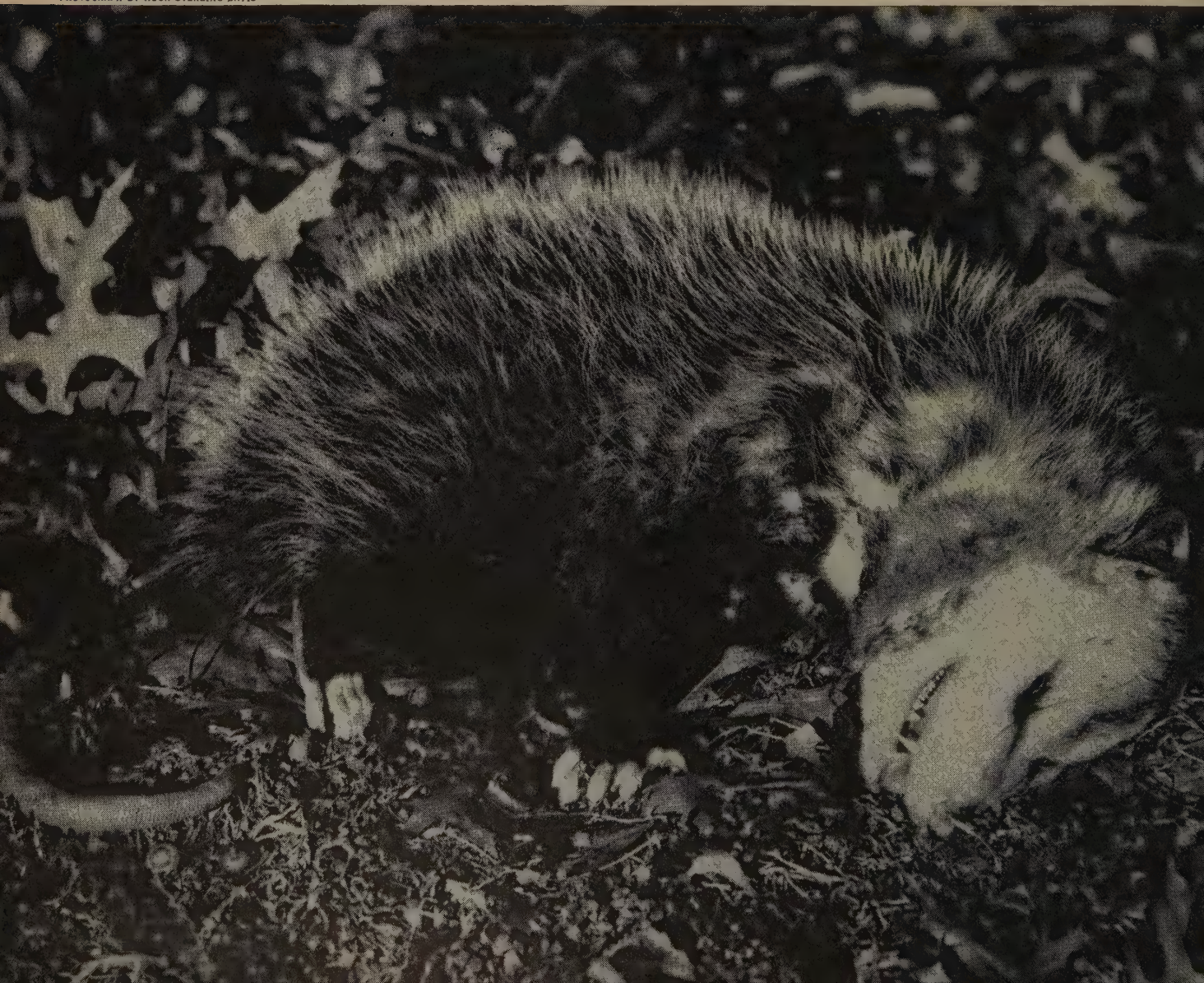
While some animals and a good many birds will try to hiss like snakes, I believe the best imitation is given by the wild turkey-hen when she is brooding eggs on her nest in the thick underbrush. On several occasions I have leaped away from that sound—only to find that I had almost stepped on a turkey nest. Young turkeys early develop the power to hiss.

All wild creatures, when wounded or disabled, resort to amazing stratagems in order to survive. Once when I was in the woods at twilight I saw a regal wild turkey in a pathetic dilemma. One of his great wings, broken by a hunter, or by some accident in the woods, was dragging on the ground. Night was coming on, and it was high time for the gobbler to be in a roost far up in a moss-shrouded cypress or lofty pine, but he could not fly to a roost. Yet to stay on the ground would be fatal, for a fox or wildcat would surely catch him.

Even in his apparently hopeless plight, however, he was not at a complete loss. Nearby was a tree that had been broken twenty feet from the ground. The break had not been complete, and the upper half formed a long incline that reached from the ground to the summit of the part that was still standing. The old gobbler walked slowly up this incline, and at length reached the top. While he had achieved elevation, he knew that he would not be safe there: a wildcat might follow him up that incline. Then, to escape all enemies of the night, this wary old tactician took a mighty leap and, beating his one good wing, made his way across a wide space, landing safely in an oak. Here he would be safe from the prowlers of the darkness—and that he really escaped them I know, because I saw him afterwards while his wing was healing, and finally I had the satis-

"The opossum feigns death convincingly—his eyes even roll back, and his mouth falls open."

PHOTOGRAPH BY HUGH STERLING DAVIS



faction of watching him beat his way, under his own wing-power, to a gnarled limb seventy feet up in a lordly yellow pine.

The fox's shrewdness is most acute when Reynard is attempting to escape from pursuing hounds. One warm afternoon in early autumn I was sitting on a stump near a stream when a gray fox hove in sight. Not far behind him the dogs were baying, and I could see that the fox was tired out from a long run. Across the stream an old tree had fallen, making a natural bridge. I was not surprised to see the fox start across this log. To obtain superior elevation and vision, Sir Brushtail often runs along dead trees lying on the ground. But what the wily gray one did next was one of the most sagacious feats that I have ever observed.

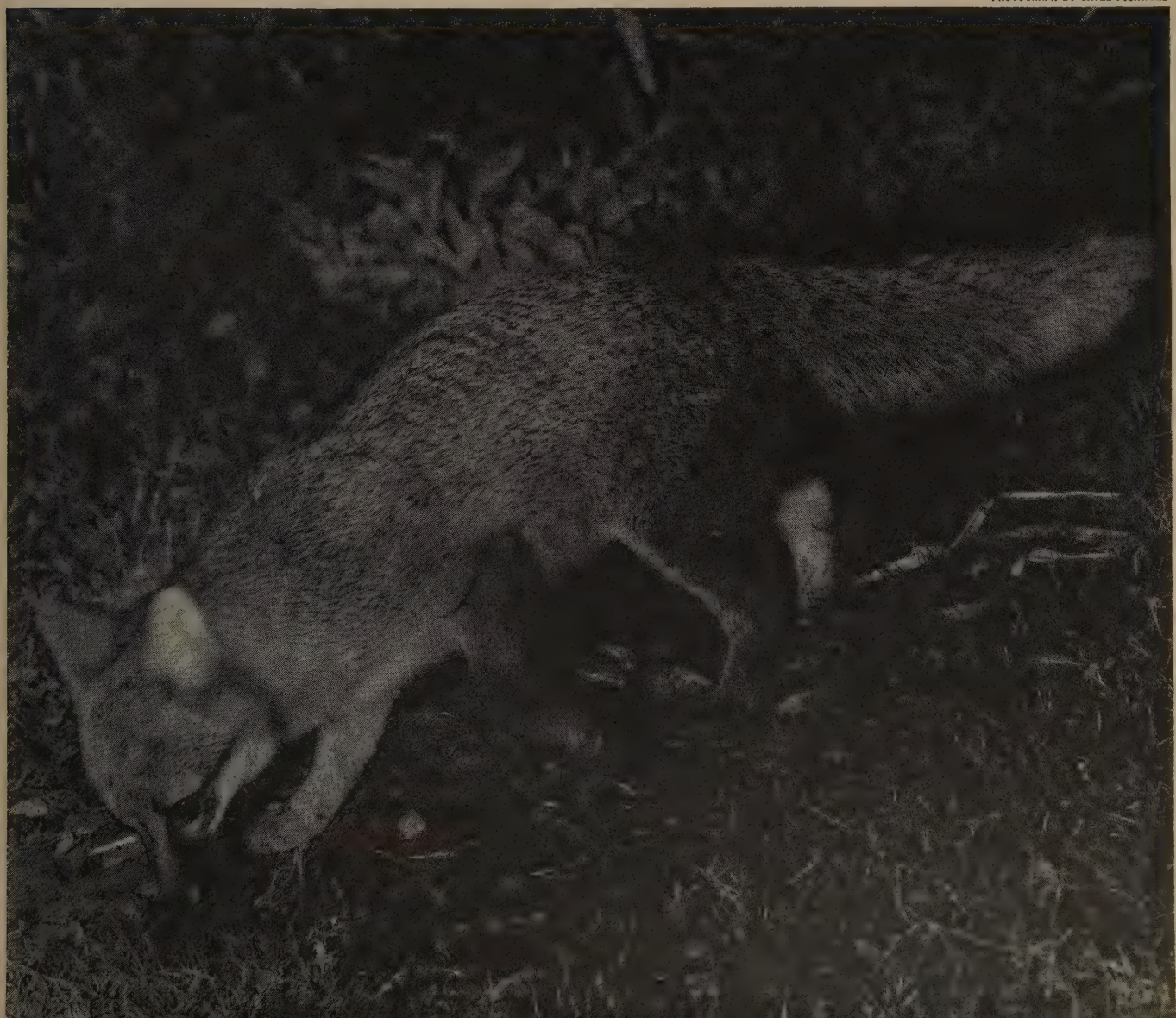
When halfway across the log, he paused, turned sideways, and peered down. Below him in the stream was a tiny green island, only a few feet in area, where lush grasses grew. Down to this islet the fox gracefully leaped. I expected that he would then jump across the water to the farther bank; instead, he jumped back to the side of the stream that he had just left. Then he ran down the edge of the stream in the opposite direction from the yelping dogs.

When the hounds came up they followed the trail to the middle of the log, then crossed to the farther side of the stream. But no scent awaited them there and for many minutes they vainly cast about to pick up the trail. Finally, with the air of creatures who knew they had been outwitted, they gave up the chase and turned homeward.

I have seen a good many thousand white-tailed deer in their native wilds, and can testify to their alertness and resourcefulness. A most appealing performance occurred one day in the pineland wilds near the humble home of a backwoodsman. I had met him in a forest path, within distant sight of his house. He had been rounding up some hogs in the woods; and these, twenty or more in number, were in the pathway ahead of us, slowly making their way toward the barnyard. As we were talking we heard a solitary hound; we were almost certain that he was bringing a deer in our direction. We sat down together on a log, and did not have long to wait. Running perhaps a half mile ahead

"The fox's shrewdness is most acute when Reynard is attempting to escape from pursuing hounds."

PHOTOGRAPH BY GAYLE PICKWELL



of the hound, a beautiful buck appeared. He was plainly tired. Both seeing and winding the hogs, he stopped—not so much to rest as to consider a situation. For at least three minutes he stood motionless and thoughtful; then he stole forward toward the path, where he deliberately fell in with the hogs and began to walk with them toward the barnyard. This strange behavior had in it wild intelligence and the deep design of high strategy. By mingling with this drove of swine the buck knew that, for the pursuing hound, his scent would cease to be solitary and compelling.

Within thirty yards of the stable lot the buck left the path, stealing away through the woods. By this time the hound was within sight, and we watched to see whether the buck's ruse would outwit him. It did. Coming to the path, he fell in behind the hogs, ran them full cry, and chased them into the barnyard. After all, this was more exciting than following a deer he had never seen!

In Poe's famous story, *The Purloined Letter,* the missive proves impossible to find because it is not really concealed at all; it had merely been put in such an obvious place that the searchers never thought of looking for it there. This principle—that the best hiding place is not always the most secret—is to be observed in Nature. On my southern plantation lived a famous buck, so huge and superbly antlered that he had become a legend to local hunters. One winter I missed him from his accustomed haunts in the woods, nor did any hunter report having seen Old Roland, as he was called. He never appeared during the long hunting season, and I was afraid that he had been killed.

After the season had closed I was talking one day with an old Negro named Steve, whose tiny cabin stood in a field of broom sedge and fennel.

"How come nobody hunt Old Roland dis year?" he asked me.

"Everybody hunted for him," I said, "but nobody found him."

Steve doubled up with laughter. "Dat old buck been sleepin' close by my house all winter," he said. "I done see him 'most every day. Lemme show you."

In the fennel and broom grass, not more than 50 feet from his cabin, Steve pointed out to me where Roland had slept. While the hunters had ranged the distant woods in search of him, he had couched here in safety, in the sanctuary afforded by the neglected field of the lonely and harmless old Negro. Instinct must have told the buck two things: first that Steve was no hunter; secondly, that no one would dream of looking for a wary old stag living so close to an inhabited cabin.

In crises, the ability to remain perfectly motionless until danger has passed is a favorite—and usually successful—ruse of wild creatures. The knowledge that perfect quiescence will save them goes deeper than dependence on mere protective camouflage; it requires something very much like *character* to let an enemy come perilously close, and yet make no frightened burst for freedom. Oddly enough, the deer, almost the fleetest of animals, frequently takes refuge in utter immobility. I once saw what appeared to be a set of antlers protruding from behind a fallen pine. I froze into immobility and watched for at least 20 minutes. They did not move, and I concluded that they were bare branches of the dead tree. But as soon as I moved they proved to be real antlers after all; the crafty buck had been watching me, and had at first decided that standing still was a better maneuver than running away.

Another time I saw a doe standing in a greenwood with her tiny fawn. Like a statue the mother stood looking and listening, but the baby wanted to play, and kept running around her on unsteady legs. At last, aware of the danger of this infant behavior, the doe raised her forefoot, gently but firmly set it on his back, and pressed her baby down into the grass, thus hiding him and keeping him still.

One of the most ingenious acts of a wild creature I ever saw was that of a snowy egret that I spied while it was wading knee-deep in the shallows of a sea marsh. Every few minutes it would dart its javelin-like beak into the water. Fishing was good. Its appetite satisfied, the bird lifted its wings to fly away. But its efforts were unavailing—the egret seemed to be anchored where it stood. Plainly in distress, it struggled to free one leg. Just as I was about to go to its aid, the bird managed to lift itself into the air. Dangling from its left foot was a huge clam. The egret had stepped into the clam's open shell and the mollusk had closed on it like a vise. I watched, curious to see whether the bird could meet so perplexing a dilemma—one which might eventually result in the egret's starving to death because of the hampering weight.

Running out into the water was an old fence. Flying off-balance to it, the egret alighted on a fence post. For a moment he teetered on one foot; then, lifting his imprisoned foot high, he began to whack the clam against the side of the post. Soon the shell broke at the hinge, and the clever egret, freed once more, calmly preened its feathers as if such a misadventure were all in the day's work. And, indeed, such crises do make up no small part of the life experiences of wild animals.

Prophets

By LALIA MITCHELL THORNTON

A Bob White calls, I am not sure from whence,
But I mistrust that shadow on the fence
May fly away. And from a distant hill
There comes an answer, jubilant and shrill.
More Wet! More Wet! They both of them agree.
More Wet! More Wet! As though assuring me.

The shadows deepen now, there should be soon
Below that thin gray cloud a crescent moon.
There are some things I cannot understand;
But, surely, these are raindrops on my hand.

Porcupines of the Shell World

By CARROLL LANE FENTON

On seashores, when the tide is low, we sometimes find pink or orange shells that are fastened tightly to rocks. They have two halves, or valves, like clams and oysters, but their bodies are very different. They generally are called lamp shells, for their longer valves resemble the bronze lamps used by ancient Greeks.

Barely a hundred species of lamp shells live in the seas of the world today. In early ages, however, they were both abundant and varied. Strangest of all were species shaped like ladles or cups and covered with long spines, like porcupines of the shell world.

For years students of fossils have wondered how these odd creatures lived. Dr. G. A. Cooper, of the U. S. National Museum, seems to have solved the problem by finding this specimen. The fossils were preserved in glassy silica, and were much too delicate to be broken from the limestone that covered them. Dr. Cooper decided to dissolve the rock in acid, taking care not to touch the fossils.

When he did so, he uncovered a tangle of shells whose spines are even longer than anyone supposed they could be. They also are tangled together so tightly that they must have grown that way. Apparently these "sea porcupines" lived in one intertwined mass in a quiet corner. There they grew and reproduced, feeding on tiny organisms that floated in the water. When they died they became this fossil, which Dr. Cooper found among the mountains near Eureka, Nevada.

Growing the Painted Trillium

By EDWIN F. STEFFEK

One of the most charming of spring plants is the painted trillium, and it is one that can be grown away from its native haunts if given the proper conditions. Good light, very acid soil of about half leafmold, and a shaded place where it will not dry out, are necessary. Given these, trillium will produce its attractive, three-petaled, white flowers, marked with pink, in increasing numbers with the passing years.

Unlike most other trilliums, *Trillium undulatum* is exacting in respect to the acid soil. It is a bosom companion of the dwarf dogwood, or bunchberry, and trailing arbutus. Like the other trilliums, it grows from a short heavy rootstock ranging from two to six inches or more underground. It may be moved at almost any time if this can be done without damaging the feeding roots. The best time, however, is in early fall.

Propagation may be accomplished by seed, which should be planted as soon as ripe in a light, sandy, humus-filled soil. Under proper conditions it will come up the following spring, and the plants will probably begin to flower three years from then. Rather than wait for natural division to take place, it is also possible to produce new plants by injuring the corm. If the top of the corm is cut off, both halves may be planted, or if a ring is cut out where the new growth joins the old, a number of small bulbs will form by the following spring. These may then be planted out separately and will become new plants. Thus, with some care, the painted trillium can be made to grow in your garden.

The rarity, commercial value and wealth it brings make ambergris the

Beachcomber's Bonanza

By SAMUEL HUDSON

One of the few good things that may result from the treacherous attack on Pearl Harbor concerns the cachalot, or sperm whale, *Physeter catodon*, and, indirectly, the perfume industry. On December 7 this sea-monster lost its most persistent enemy—the Japanese.

The Sons of the Rising Sun have had a lessened competition in whaling since the Germans quit the field when World War II began. American whalers were practically out of the picture prior to that time. This gave the Japs their chance. Since they have never abided by whale conservation treaties, and were on the make, they undoubtedly ran Mr. P. C. ragged in 1941. Now, with the United Nations' declaration of an open season on Japanese shipping, it is a safe bet that Nippon's whalers will have neither the time nor the inclination to bother *Physeter catodon* for some time to come.

The longer the inactivity of the whalers, the farther removed the day when the sperm whale becomes extinct. The farther removed that day, the better for the perfume industry, for the sperm whale is the only known source of the perfumers' delight—ambergris.

Ambergris, French for "gray amber", is a waxy, opaque, laminated substance found on rare occasions in the intestines of a sperm whale during butchering operations. On even rarer occasions it is found floating in the sea, or cast up on the beach. Soft and waxy when plucked from its resting place, ambergris hardens in the air. It appears in various colors, including white, yellow, black, or ash-gray, or is variegated like marble. Gray is superior to all others. Ambergris, as it is found, varies in size and weight from pieces weighing a fraction of an ounce to masses of several hundred pounds. It floats easily in both fresh and salt water—in which it does not decay—having a specific gravity ranging from 0.780 to 0.936.

Perfumers put a high value on ambergris because it possesses unusual "fixative" properties. It attaches or blends various expensive scents, and prolongs considerably the lasting power of perfume. An English writer, in referring to the remarkable ability of ambergris to absorb and hold odors, says that a chunk placed in a warehouse soon took up and held the various smells of the bales all around it.

In spite of competition from synthetic products of

On the chemist's table in the Colgate-Palmolive-Peet laboratories lie two chunks of ambergris weighing eight pounds. The raw ambergris is ground and mixed with 95 per cent alcohol. It soaks for six months or more, the tincture going into fine perfumes.

modern chemistry, ambergris is considered so essential to fine perfumes, and the supply is so unpredictable, that it is sometimes worth more than its weight in gold. Its value seems to depend on the scarcity at the time. In 1927, for example, when the quantity available was limited, gray ambergris sold for $35 an ounce. In 1939, the price ranged from $17 to $36; and on March 2, 1942, the *Oil, Paint and Drug Reporter* listed it at $17 to $18 an ounce in tins.

Ambergris is one of the rarest and most valuable of animal products. During the period from about 1836 to 1880, the whole American whaling fleet produced only 1667 pounds. This included the "fabulous catch" of the "Adeline Gibbs", which brought in a 136-pound lump valued at $23,000. In 1922, the total U. S. production amounted to only 44 pounds, valued at $11,000. The largest known haul from one whale was obtained in 1859 by a Nantucket crew. It weighed 750 pounds. A lump valued at $60,000 has also been reported, and a piece obtained off the coast of Australia some years ago sold for $135,000. In 1938, a WPA worker found $5000 worth off the Massachusetts coast.

Although ambergris itself is rare, there is no dearth of "ambergris" discoverers. Each year brings a new crop of hopefuls who tender all sorts of evil-smelling flotsam to museums for identification. Hidden in the shadow of the sulphur-bottom whale, which dangles from the ceiling of the American Museum of Natural History, is a show-case full of fragments of what beachcombers once thought was the real thing. Propped against one of the fragments is a card which reads:

"Ambergris has been prized for centuries as a perfume base. Commanding, as it has, prices which have brought it fame, untold numbers of amateur beachcombers have had the dreams of fortune raised by finding a mass of floating, odorous material along the shore. Many have come to this Museum to have the identity of the prizes confirmed. Here we show some of the 'ambergris' left behind by crestfallen collectors. Among the samples are soap, wax, tallow, wood, papier-mâché, cake, rubber, fish, and the left-overs from someone's beach picnic. Much that glitters is not gold and much that floats is not ambergris."

Robert Cushman Murphy, Curator of Oceanic Birds, of the American Museum, says that in his twenty years of museum work at least forty persons have approached him with what they thought was ambergris. Thirty-nine were wrong. In fifty per cent of the cases, the "ambergris" was soap, which dissolves very slowly in salt water. An official of the U. S. Fish and Wild Life Service at Seattle recently told the writer that most of the specimens submitted to him for identification were pork fat. Early last year, the liner *Siboney* carried something into New York Harbor that the eager crew felt sure was "$2,000,000 worth of ambergris". It was not.

It is not hard to understand why amateurs go wrong when experts have a hard time identifying ambergris. No chemical methods for identification of the substance are to be found in the literature available. A well-known English chemist claims that it should be judged in much the same manner as good wine—by its appearance, bouquet, and odor. The Chinese have their own system—they scrape it on the surface of

This drawing by F. L. Jaques of the American Museum of Natural History might be described as depicting a "perfume factory". Ink-shrouded squids are greedily gulped by a bull sperm whale and from analysis of specimens of ambergris, which reveal squid parts, they are, in a way, raw material for ambergris.

boiling tea. If it dissolves they claim it is the real stuff.

Probably the best way to determine whether an object is true ambergris is to dip it in hot alcohol and run a hot wire through it. If it is ambergris it will dissolve in the alcohol and retain its uniform, fatty substance when penetrated by the wire. Thorpe (*Dictionary of Chemistry*, Vol. 1, p. 85) claims that true ambergris sticks like wax to the edge of a knife when scraped, is brittle, takes a high polish, and retains the impression made by the finger nails.

Attempts have been made to make artificial ambergris, but no one has been as successful in this field as the Frenchman who manufactured artificial musk and is supposed to have obtained a million dollars for the secret. Adulteration and substitution have been practiced for years. In addition, crooks have attempted to pass material that often has proved difficult to distinguish from the true substance. One cheap specimen contained fragments of moss and bark to produce the speckled appearance associated with ambergris. In other cases, fakers have mixed the beaks of squids into tallow or tree gum, since indigestible parts of squids are often found in real ambergris.

Characteristic of ambergris is its peculiar odor, described variously as "sweet", "earthy", and "vile". Murphy says the odor is suggestive of musk or benzoin and "is as subtly pleasing to the majority of human beings as catnip is to cats—yet decidedly offensive to a few persons". D. C. Stull, the "Ambergris King" of Provincetown, Massachusetts, once told an interviewer that "all ambergris has a faint odor of tobacco leaves".

Like those other perfume fixatives of animal origin—musk, castor, and civet—ambergris is not recognized as a perfume in its original state. It is too concentrated to be attractive to the average person. The best way to illustrate the difference between ambergris in its strong form as opposed to its extremely diluted state is to call attention to the phenomenon of the homely garlic. Rubbed lightly on the inside of a cooking bowl, garlic imparts a flavor that invariably tickles the palate of a person who would never dream of tackling the odoriferous bulb in stronger doses.

At work on a whaler. Here the thin, tough blubber of the head is being peeled to expose the case, which will be split and bailed. At the right the cistern of the spermaceti from a large sperm whale is being emptied with a thimble-shaped bucket. Photographs by Robert Cushman Murphy, courtesy of the American Museum of Natural History.

Although it took a long time for the experts to get around to the idea that ambergris was "manufactured" by sick whales, the association between whales and ambergris was noticed ages ago. Morley and Hodgson, in their *Whaling North and South*, quote Jorath, the Chaldean, as writing: (Continued on page 108)

In World War I we had a ditty to the effect that "all we do is sign the payroll, and we never get a . . ." well, we never get a cent, which was not precisely accurate. Also we were convinced that the inevitable result of reporting for sick call was to receive a couple of CC pills, or a dab of iodine, or both. We had wondered whence came these CC pills, and since cascara has undoubtedly signed up for this war, it seems our duty to make this report by Mr. Wiley. EDITOR.

★

Cascara Goes to War

By LEONARD WILEY

Peeling cascara bark, which is removed as high as possible before the tree is felled. Bark is left on the base of the stump to encourage new sprouts.

Herb Rydell girdled the cascara tree four feet above the ground. Concentrically he circled it a foot and a half lower. Then, slitting the bark between the two cuts, he inserted the blade of his knife under the edge and peeled off the big sheet of bark.

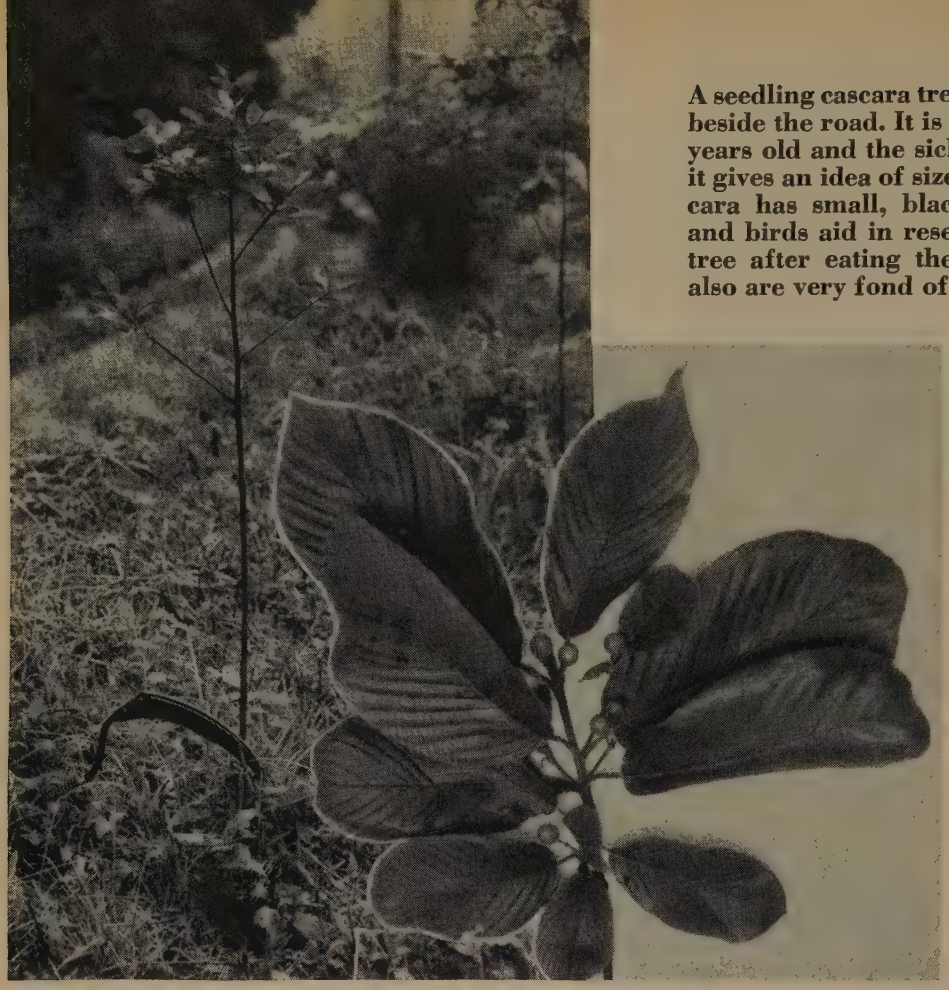
Another and another section quickly followed. When the tree was peeled down to six inches above the ground he chopped it down and finished the job. All the limbs down to one inch in diameter were stripped. He got twenty pounds of bark, which dried down to 10.2 pounds. One of the local buyers near his home in the coastal mountains of Oregon bought it. At the going price of seventeen cents per pound, he earned $1.73 for less than an hour's work. It was an ordinary-sized, cascara buckthorn tree, *Rhamnus purshiana,* nine inches through and about twenty years old, growing on the edge of one of the farm fields.

Mr. Rydell did more than make a little quick money. The bark he collected will furnish enough of the prepared medicine for one dose to each of 2345 soldiers or sailors. He, and many others like him, are furnishing a needed drug for our war effort. Scattered all through the coastal mountains and valleys of Oregon, Washington, and British Columbia, are farmers, itinerant workers, and not a few children too young to get steady jobs, who are peeling "chittim" bark. All these people are working in a "defense" industry.

Both the Medical Department of the Army and the Bureau of Medicine and Surgery of the Navy are using cascara sagrada. The amounts of this material required by our military forces is a secret of the War Department. However, it occupies an important place in the medical end of our war plans.

As a laxative the drug has no peer. It increases the secretions of the gastro-intestinal canal; its bitter principle acts as a tonic; it improves the appetite and digestion, and prevents the constipation that often follows the use of other drugs. These qualities are so pronounced that the dosage can be gradually reduced and discontinued altogether without the original condition returning.

The collecting season is short. Theoretically peeling can begin as soon as the sap is up early in the spring. But the weather is then usually too unfavorable for



A seedling cascara tree growing beside the road. It is about two years old and the sickle beside it gives an idea of size. The cascara has small, black berries and birds aid in reseeding the tree after eating these. Bears also are very fond of the fruit.

consistent work. As soon as the sunny days come to stay the peeling goes ahead in earnest. Late in July the sap begins to go down and the bark will not slip readily. Throughout August, however, along streams and other wet places, the bark will usually peel easily. But that marks the end of the season. Abnormally wet weather and dearth of collectors accounted for the short crop during 1942 when the drug was urgently needed.

Other species of buckthorn are found in Europe and Asia, but cascara is native only to the western part of North America, principally in the United States. We have an absolute world monopoly of the drug.

Its commercial range is confined to the coastal regions of the far northwest, where it reaches its greatest size. Trees two and one half and three feet through and sixty feet high have been reported. Those half that height and six to fifteen inches in diameter are good sizes for mature stands.

Since the early part of the nineteenth century the tree has been known to the Mexican and Spanish priests of Old California, who learned of its medicinal value from the Indians. These missionaries named it "cascara sagrada", or "holy bark", because they thought it was the same "chittim" wood that was used in the Ark of the Covenant. It was also supposed to have been used for dowel pins in the construction of King Solomon's Temple. In this the priests were mistaken, however, for the "chittim" of Biblical days was acacia.

Members of the Lewis and Clark Expedition discovered it on the banks of a tributary of the Columbia River about 1805. Eschscholtz, the Russian botanist, found it on the coast of California in 1816.

Closely-related species have been used from very early times, but it was only within comparatively recent years that cascara became a well-known drug. Dr. J. H. Bundy of Colusa, California, published an account of its medicinal value in 1877. Immediately afterwards Parke-Davis offered a legitimate preparation of the drug to the medical profession. A new industry was born.

Collectors sell to dealers who in turn sell to the pharmaceutical houses where the brittle bark is converted into the prepared drug you can buy in the drug stores.

A couple of years ago a farmer with five hundred pounds of bark drove up to the office of one of the small dealers and tried to sell his product. He could not even give it away. He had collected red alder bark, which somewhat resembles cascara. There is one positive way of identifying the tree—chew some of the bark. It is nauseatingly bitter and the taste lingers for several hours. Some people seem not to mind the strong flavor. A friend of mine, who, on occasion, chews the bark for an hour or so, says the practice will cause a temporary loss of the sense of taste a few days later. At any rate the bitterness is unmistakable.

Willow, dogwood and hazel are other trees sometimes peeled by novices whose zeal for ready money exceeds their knowledge of botany. None of these barks ever get into the prepared cascara you buy. The dealers are quick to spot adulterations and remove them from the submitted collections.

The bark has to be aged before it can be prepared into a usable medicine. Some say it can be cured in six months; others claim two years. At any rate the older bark is more valuable. Collectors used to take advantage of this fact by claiming they had aged bark in order to get a better price for it. But the dealers discovered a way to get at the truth. When newly-dried

Cascara tree cut several years before has sent out several sprouts from the stump, insuring another crop of bark. Below, a felled tree on which the bark is peeled down to the branches only an inch in diameter. Thus waste is kept at a minimum. Note the pile of bark lying at the stump of the tree.

it has a greenish cast just under the surface. This disappears a year later and the bark turns dark brown.

Ownership of the trees means little. The rule—if there is one—seems to be to get the bark wherever possible without worrying about whose property rights are being violated. There is no other plant in the entire far West that is so ruthlessly destroyed wherever it can be found. Arrests are not uncommon and are becoming more frequent with the present extremely high price of the bark. Fences and "No Trespassing" signs are ignored. A farmer, for instance, owned a large tree from which he collected and sold seed every year. There is a small demand for this by-product. He went to bed one summer evening with peace in his soul and love for his fellow man in his heart. When he woke the next morning and looked out the window these kindly sentiments vanished into a cloud of rage. The tree had been stripped during the night. Such depredations are common. They are confined, however, to private lands in general. State and national forests are too well watched by fire guards for many people to get into or out of the woods without being observed.

Since the first virgin trees were cut collectors have gone farther and farther into the great forests in their endless search for the medicinal bark. New roads, trails, and CCC camps have helped collectors get back into untouched reserves until the old trees have become difficult to find. The majority of the bark comes from hedge rows, farm lands, roadside thickets, and logged-off land where the trees, although smaller than the original stock, are more plentiful and easier of access.

Officials of the Forestry Branch of the Canadian Department of Lands estimate that the native stands of the tree in British Columbia will be depleted within seven or eight years at the present rate of harvesting. Somewhat similar estimates and guesses have been made for the forests of Oregon and Washington. That the virgin trees are largely a thing of the past is without doubt. But other factors alter the outlook considerably.

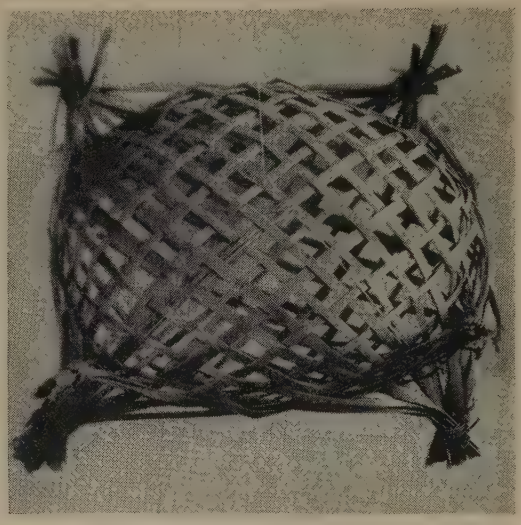
Trees cut six to twelve inches above the ground with the stumps unpeeled will usually send out new shoots, numbering anywhere from one to twenty. In the course of a few years these sprouts can be profitably peeled. In granting permits to collectors the Forest Service requires that trees be handled in this way.

A common practice is to leave the trees standing and peel the bark as high as it can be reached. Not more than half the crop is obtained with this method and the practice kills the trees. The sap goes up the outer layers of wood to the top of the tree, where, through the action of the sun, the leaves manufacture food. Normally this elaborated food goes down the bark and is stored in the roots. With the protective layer gone it can not get to the root system, which is thus too exhausted to send out sprouts. Other species of trees might be able to survive such treatment but the cascara does not send out new shoots readily. When the trees are chopped down, however, the sap can not leave the roots except by new sprouts. (Continued on page 108)

Grasshopper Pets in China

A pet grasshopper and, below, one of the cages made from interwoven bamboo roughly tied at the corners.

By
MABEL
IRENE
HUGGINS



It would have been incomprehensible to the Kansan pioneers who lived through the terrible grasshopper invasion of 1874, or the Mormons who were saved by the gulls, that anywhere in the whole world people would keep grasshoppers as pets. In China, however, where the unbelievable often seems to be the daily occurrence, as the Japanese frequently find out these days, the grasshopper is a treasured pet.

As a pet, everything is in the grasshopper's favor. In China the price on pet birds runs away up into the tens of dollars because of their scarcity. To satisfy a pet-craving, however, a grasshopper may be purchased for a few copper coins. Just as in America, the pet bird in China must be fed and watered, but in addition it must be taken out for air and otherwise pampered. Old men, in particular, are constantly seen strolling along with bird cages. Much time must be consumed in giving birds the airings that they seem to require.

There are, of course, other pets in China—dogs and cats, for example, but these, as everywhere, must be cared for and fed, and in North China, where the winters are severe, dogs must be supplied with dome-shaped shelters of woven grass. Then, too, since Japan started the "Chinese incident" life has been harder than ever and there is no food to spare for hungry pets.

In contrast to all this, how easy it is to provide for the needs of a grasshopper! A bit of cabbage leaf is its favorite diet. And a simple cage gives it a feeling of refuge and security, while a more elaborate one pleases the owner of the pet and indulges a craving for the artistic.

Annually millions of grasshoppers are caught in rural districts and carried to densely-populated cities. There, throughout the autumn, grasshopper vendors may be seen in sunny nooks along the streets, or in market places.

The grasshopper merchant surrounds himself with a great variety of small cages. The simplest of these is made from interwoven strips of bamboo with the ends tied crudely at the corners. Many cages are made from

A grasshopper cage made from a gourd with rough decoration on it. The top is provided with perforations to assure the pet air supply.

A Chinese grasshopper vendor. He deals both in the insect pets and in a wide variety of cages in which these inexpensive means to satisfying a desire for a pet may have habitation.

A quite decorative cage with silken tufts on the lid to aid in lifting it. Note the decorations in low relief, the uncarved portions in light red, and the row of dominoes for decoration.

little gourds. When growing, some of the gourds are forced to grow into molds which produce roughened effects that provide the base for decorations that are applied later—a dragon, a horse, a human figure, or whatever the craftsman's fancy may dictate. Sometimes the gourds are left quite plain and without ornamentation. At times they are carved in low relief, the uncarved portions being brightly colored. Apertures may be cut through the walls of the gourds in order to supply air to the insects caged within. To facilitate opening the cages, gay silken tufts may be fastened to the lids. Many of these gourd cages are fitted with carefully-made wooden lids that have holes to admit air. Cages that have constricted necks are equipped with wire partitions at the smallest point, dividing the inner cage, which holds the grasshopper, from the outer cage, into which the simple food needed by the pet is inserted.

Grasshopper pets are happiest when they are given a sufficient amount of genial warmth. I recall that one day I heard a jovial *scree-e-e-e, scree-e-e-e* as I was passing down the aisle in my classroom in a Chinese girls' school, and I knew that a contented grasshopper was enjoying the snug protection of a schoolgirl's pocket.

"As shuttle at the sounding loom
The tireless cricket creaks."

These lines, written about 900 years ago by Ou-yang Hsiu, are just as applicable to the pet grasshoppers that have come under my observation as to an 11th-century cricket. Every year in the late autumn it has been the custom of my Chinese cook to hang his grasshopper cages on the wall by the kitchen stove. There, at a pleasantly comfortable temperature, his pets express pleasure in life by their "tireless" creaking.

Another gourd cage for the insect pet. The designs on the outside, while not notable as art, add much interest to these grasshopper cages.

The Snail Highway Department.

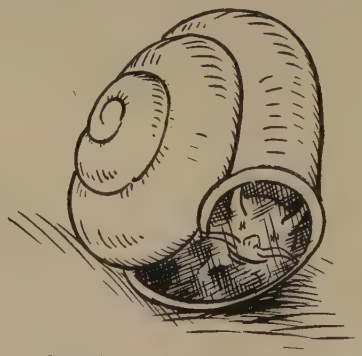
Slugs and snails in the garden are often despised but they are interesting—these

Humble Backyard Neighbors

By ELLSWORTH JAEGER

OUR humblest neighbors are sometimes changed to extremely interesting folks when we become better acquainted with them. This is also true of the lowly snails and slugs, common residents in your backyard and mine. Too often people look upon them as unlovely creatures, incidentals in our fish aquariums or invaders to be exterminated in our gardens. Yet if we investigate their lives, we find they are really amazing children of Nature.

Each snail and slug is a whole highway department in itself, for it lays countless snail miles of roadway during its life. Snails make "glass" windows and doors for their shell houses, and slugs make rope swings in which to do their love making. For these accomplishments alone we should become better acquainted with these animals.



Snails build themselves glass doors to home.

In our gardens we sometimes find silvery, winding roads that weave in and out of the vegetation, and even upon the plants themselves. These shining ways are the blazed trails of our common snails and slugs. Unlike our pavements, theirs are sticky and slimy, made from a mucous secretion discharged from the slime ducts just below their mouths. On this roadway they glide forward, advancing with the help of cilia, which cover the sole of their one and only foot. By drawing in and pushing forward in a series of waves, the foot is gradually advanced. Their trails clearly show a series of wavy ridges made by this action. It would take a snail about fifteen days to cover a mile, while slugs, unhampered by a shell, travel faster—about a mile in eight days. There is reason, therefore, for the expression "a snail's pace" being the figure of speech used to describe slowness.

The slime road bed not only smooths the way for snail and slug, but it forces them to stick to the trail, whether they be right side up or upside down. Often the slugs may be upside down. They discharge mucous like their snail relatives. But with this material they can form threads that enable them to drop quickly from bushes and shrubs. When they do this rope trick they go down head first, gripping the threads with the sides of their lone foot. They can also climb up again, but this is slower and requires more effort. In making the ascent, the slugs climb head uppermost. They seem to climb by bringing their heads and tails together, gradually gathering the accumulated thread near their tails.

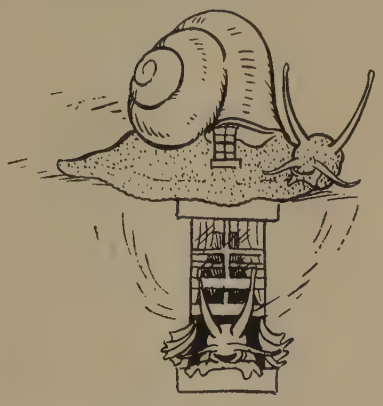
Some of the water mollusks make these mucous ropes to aid them in get-

Slugs have no housing problems to contend with, a boon many desire today.

Slugs are adept at the rope-climbing trick.

Slug love-making turns out to be a rather topsy-turvy affair.

The snail takes a deep breath out its window.



ting to the surface of the water. Often the ropes are attached to water plants, but frequently they are supported by the surface film alone. This sometimes looks like a "Hindu rope trick", but there is no magic about it for the upper end of the rope is spread flat like a float upon the surface film.

The slugs have another use for their ropes. Slugs and snails are male and female in one, like the earthworm. In spite of this fact they court another, the slugs often "spooning" in a swing. They make this with two threads of mucous, then cuddle and swing back and forth in mid-air. However, they swing with their heads toward the earth, which makes a touching but rather topsy-turvy love scene.

The snails carry shell homes upon their backs. These increase in size as the mollusks grow. Snail shells show this growth in well-marked lines. Besides the regular lines of growth, there are accented lines some distance apart and often separating areas of different depths of color. These are thought to indicate each year's growth. Just under the shell on the back of the snail is the shell-making mantle. It is here that the shell material is laid down, forming new shell growth. Under the edge of the shell, too, is an opening or breathing pore by means of which the snails catch their breath of air. By slowly opening and contracting this pore the air is sucked in or forced out of the snail's body. It is much like opening and shutting a window in a house, the fresh air rushing in when the window is raised. Snails often breathe through the skin, which is kept moist for this reason. This is especially true of the slugs.

When danger threatens the snails simply draw themselves into their shells. This is done by a series of strong muscle fibers that pass down into the foot. By contracting these they pull themselves into their shell armor.

At times drought comes to the snail world. To protect themselves from unpleasant dryness, and, also, to prevent any further evaporation of moisture, they place a pane of "glass" over the entrance to their shell house. This they make from the mucous secretion. After they are safely within the shell the thin mucous film is stretched across the entrance. This hardens quickly into the transparent "window pane". They close their houses for the winter in the same way. But at that time the door is barred with a heavy pane that is not transparent. At times their shell home may be double- or triple-barred with several glass doors, one just above the other at the entrance. The snails must carefully conserve moisture, for they use a lot of mucilage making road surfaces.

Long ago the slugs got rid of their shell houses. Perhaps Nature held the mortgage on their dwellings and claimed them when the slugs failed to meet payments with enough calcium carbonate. Or it may be that the slugs are just mollusk tramps that have no use for houses, or are too lazy to build them. So they wander through our gardens, taking their joys where they find them with never a real estate care.

Indications found on certain slugs, however, show that in ancient times their ancestors might have carried houses about with them, just as their cousins the snails do today. Some species of slug have a "shell sac", which contains numbers of calcium carbonate crystals for shell-making. Other slugs even have a small shell still present, often with traces of a spiral-like growth.

★

The year's at the spring,
And day's at the morn;
Morning's at seven;
The hillside's dew-pearled;
The lark's on the wing;
The snail's on the thorn;
God's in his heaven—
All's right with the world.

ROBERT BROWNING

Nature in Print

By HOWARD ZAHNISER

ECLIPSE **By Rosalie Rees**

THOSE of us who have the rhymes and rhythms of Longfellow persisting in our minds from the schooldays of a somewhat different educational dispensation know that biographies are supposed to be reminders of a certain—or rather an uncertain—sublimity that is right and proper for all of us. How the sense (or reality) of exaltation or elevation—which I believe are the choices in the sublimity of human character—may come to us will, I suppose, depend on which man's life is the current reminder. Longfellow, of course, wrote of "all" lives of great men and perhaps thought only of the general example of greatness. Certainly he went no further with his directions toward sublimity but hastened on to predict the influence of our own walk through life. Nevertheless, the use made of Longfellow's text by my boyhood pedagogs has always led me to suppose that every biography is essentially an example in some way or another, and I have thus the benefit of many reminders of what may or may not be personal possibilities—depending on how realistic Mr. Longfellow actually was in his appraisals.

I recently read *Edward Sylvester Morse, A Biography*, by Dorothy G. Wayman, and then proceeded to a reading of *This Green World* by Rutherford Platt, because my first glance at the book's description by the publishers had identified it as "the lively and revealing chronicle of a naturalist." Lively and revealing as the book assuredly is, I soon found that my reading of "chronicle" as a synonym for "autobiography" was somewhat faulty. Yet first impressions being as influential as they are, I found myself persistently thinking of Mr. Platt, as well as of his exciting descriptions of trees and flowers, looking until the very end for a resumption of the autobiographical references that Mr. Platt actually abandons on the eighth page. Even at the end, considering the entire book, I saw deepest significance and greatest interest in its incidents of autobiography—few, but critical and revealing. With my "conditioned" attitude toward biography, I began to think of both *Edward Sylvester Morse* and Rutherford Platt's *This Green World* as reminders of sublime possibilities.

Both books are of intense interest and real value, read from any point of view.

Mrs. Wayman's thorough yet vivid characterization of a remarkably versatile genius who lived from 1838 to 1925, her record of his accomplishments during a life that never tired or reached retirement, and her description of the scenes of his activity are so successful that, as Thomas Barbour says in a foreword, "it is hard to understand why there has been no biography of Morse until this late date."

Edward Sylvester Morse could illustrate his lectures with drawings made with both hands at once. He could keep on his desk, and chuckle at, a jar prepared for his brain when death would give other scientists a chance to look there for the secret of his ambidexterity. He could play a flute with his nose, and do this while the great Salem fire was sweeping toward his home, with its priceless library and collections. He was a "character" in many other ways, but most important of all he was a great zoologist—and a zoologist who could take enough time out of his long life to write enduring books, to become an authority on Japanese pottery, or to trace the progress of civilization by means of data he himself collected on different ways of arrow release in use of the bow.

"The success and the never-flagging personal interest and delight in research that made life exciting and fruitful to Edward Sylvester Morse over the long span of seventy years rested," says Mrs. Wayman, "on the tenacity with which he seized and pursued a new idea. In 1856 at Bethel, observing differences between tiny earth-colored land shells, he began the long study of Mollusca that led him to Agassiz, to Darwin, to the far island of Japan, to Virchow in Berlin, to Sir Richard Owen, Huxley and Haeckel in London. In 1878, in Tokyo, he initiated profound observations of differences in pottery that made him the world authority of his time on Oriental ceramics."

Thus his biographer in the midst of her work introduces still another of his accomplishments in versatility—diligent versatility.

Mrs. Wayman's book has no defects of adulation, however. She appraises (Continued on page 106)

Hello! Do You Hear Me?

By E. LAURENCE PALMER

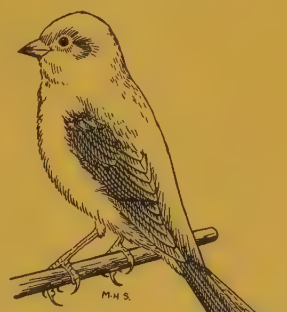
This is the twenty-third in Nature Magazine's series of educational inserts.

•

The range of the horned owl's hoot is a most restricted one as is shown on the chart on pages 84 and 85.

A FRIEND of mine has a canary with which she carries on a one-sided conversation. She insists that the canary understands what is said. I have long been convinced that the canary has not the slightest idea what I say to it, although I do not indulge in the high-pitched "baby talk" my friend uses. It is plain that certain phonograph records, and some radio music, will stimulate this canary to sing, while others produce no such effect. What is the story back of all this anyway?

Most of us think that others see, hear, feel, smell and taste much as we do. It is obvious that a dog can use his nose more effectively than we can, but since he responds to our spoken commands we think he hears as we do. It is another story, but Lutz and others have shown us that insects see through a different part of the spectrum than we, and if such variations exist in the realms of smelling and seeing why should not there be similar differences in the realm of hearing? If those differences exist, some understanding of them may help us more truly to appreciate some of the things that are constantly going on about us. Such mastery might even lead us to improve some of our techniques used in carrying on communications of various types.



The author's friend gave her canary credit for acute hearing. The range of the goldfinch (below) is between 2750 and 7400 cycles.

The pyschologists have a field day when they get to discussing sounds. They tell us that there can be no sound in an empty room because there are no ears there to hear it, but a telephone diaphragm imbedded in a wall on one side of the room would pick up a knock on a door on the opposite side, and this could be recorded on a phonograph disc, and when played later could be heard. This, however, implies that the room has air in it, because if there were no air, the sound of the knocking would not cross the room. It is difficult to accept the idea that no sound takes place when there is no ear to hear it. If this were true a person who has become deaf might deny that there was anything such as sound, even though his memory told him differently.

As a matter of fact, there are plenty of sounds that none of us ever hears, or ever will hear, and there are some that only a few of us can hear. Within certain limits, we can improve our powers of hearing and interpreting sounds, and the rewards are almost invariably worth the effort.

Everyone should know how the keyboard of a piano looks, and where to find Middle C on that keyboard. This Middle C is pitched at the same key as the "hoot" of a great horned owl. The physicist tells us that sound waves pitched at Middle C would reach a given point at the rate of 256 a second. While the Middle C tone is produced by striking a key in the middle of the piano keyboard, it does not represent a point between the extremes of high-pitched or low-pitched sounds capable of production by the human voice or heard by the human ear; and while a domestic pigeon may hear it, it is doubtful if my friend's canary or the English sparrow or starling in my front yard ever heard or ever will hear a Middle C tone. This means that these birds would not be affected in the least by the hooting of a great horned owl because they could not possibly hear it. If the starlings were psychologists they might even deny that the owl hooted because they could not hear it do so.

The chart on pages 84-85 of this insert shows the range of hearing of some common animals and the range of pitch of the songs of some common birds. Some of the things shown on that chart may be surprising. One of the things that may surprise my friend who talks to her canary is that the lowest pitch at which a canary can hear a sound is the highest C at which a soprano can ever reach with her voice. Maybe some of my friend's "baby talk" hits that point but I have my doubts. And while the canary could get no information whatever from the sounds we produce in our ordinary conversation, neither can we get any information at all through our ears about some sounds that are perfectly audible to the cats, rats, bats and dogs of our neighborhood. While we can hear no sounds ordinarily above six octaves above

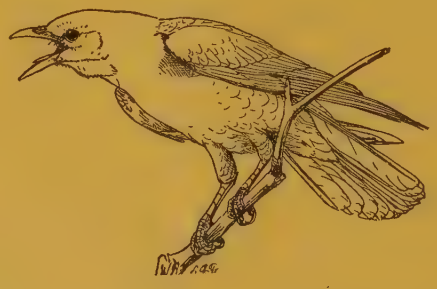
Middle C, bats produce and hear sounds in the eighth and ninth octaves above that point. Dogs can hear sounds an octave above our uppermost limit. Thus a whistle can be made that will call a dog but be soundless to us. Rats can hear sounds in the second octave above our uppermost limit, and it is quite possible that they can carry on communications by sounds that we can hear no better than can the canary hear our conversation. Dogs can hear sounds pitched up to 35,000 cycles per second; cats, up to 50,000; rats up to 40,000 and bats carry on their acquaintance with the world with some sounds pitched as high as 90,000 cycles per second. These last sounds are at least two octaves higher than anything we could hear when we were at our best.

At the lower end of the range of hearing, we apparently can do better than the dogs, cats and rats. Just hit the bottom key on your piano and you will hear a sound that your dog or cat cannot hear. Try some time to see if you can make your dog or cat respond to that sound.

The bat makes sounds that go beyond the range of human hearing.

Of course, just being able to hear a sound is not wholly important. We happen to be at our best in enjoying sounds around Middle C, but that is not the case with the dogs, cats and rats. All of them are at their best listening to sounds pitched higher than those we enjoy. A dog is more likely to be distracted by sounds of a certain pitch. Cats are not so easily disturbed. Cats are slightly more able to distinguish minor differences in pitch than are dogs, but they lose that ability sooner than do the dogs.

The rat has a range in the high brackets, while the crow (below) operates on a much more restricted cycle.



If we were to classify our common mammals, including ourselves, on the basis of pitch of sounds that they can hear, we would have to put ourselves at a lower level than the cats, rats, bats and dogs.

We might ask at this point why mammals make the noises they do. Undoubtedly we have listened to political debates, gossip parties, pep talks, and even some college professors, and wondered why it was necessary for them to make so much noise. Undoubtedly, it is for the purpose of communicating something to some other animal, but we know that is not always the case. Most of us like occasionally to get off somewhere where we can just yell for the sake of yelling. We like to sing our heads off in the bathroom in the morning, and those who hear us may wish us success in this effort. But few of us use sounds for the same purpose that bats use it. If we move about in the night, or with our eyes closed, we can tell something of what surrounds us by the echoes that come to us when we yell. In the old days, we used to yell down the rain-barrel to notice how differently our voices sounded; but for the most part we use our eyes instead of our ears to help us find our way around in the daytime, and we hold our hands before us to feel our way past the furniture at night. Bats, on the other hand, let out a series of high-pitched sounds as they fly about at night. Their hearing is so keen that they can pick these sounds up as they are reflected to them from objects and can fly to avoid touching even twigs and branches of trees. When bats fly in the open, they give these sounds at the rate of about twenty-five a second, but when they are flying among obstructions they increase this to fifty a second.

We must remember that not all sounds produced by mammals are produced by the vocal cords. We clap our hands, stamp our feet, grit our teeth and smack our lips to make noises. Not a few mammals produce sounds similarly. Rabbits stamp their feet, as do horses, bulls and some other mammals, but it is difficult to state definitely that they do this to warn enemies or to inform friends, or whether this communication is purely incidental. We of course excel these other mammals when it comes to using tools to make sounds, whether these tools are primitive jungle drums, "hot" bands, or exquisite violins.

Of course, the artists in the use of sound among mammals are the poets, the musicians and some of the literary geniuses. To them sounds are the vehicles for the expression of the higher emotions. One of these writers exquisitely defines the limit of his hearing when he says:

"I hear a sound so fine there's nothing lives
'Twixt it and silence."

Poe either stretched his imagination, or was able to hear some of the finer sounds of Nature, when he spoke of "the murmur that springs from growing grass." But I think that Pope best considered the role of the artist in the realm of sound when he said:

"Music resembles poetry; in each
Are nameless graces which no methods teach
And which a master-hand alone can reach."

I do not care for Fuller's attempt to bring Nature and modern music together by saying: "Music is nothing else but wild sounds civilized into time and tune." Rather I prefer such a viewpoint as was Carlyle's when he said: "See deep enough, and you see musically; the heart of Nature being everywhere music, if you can only reach it." Possibly this attempt to get music and happiness from Nature is what unites so many of us who have been long interested in Nature Magazine. But we should not try always to rationalize everything. As one writer has said: "Music is not a science any more than poetry is. It is a sublime instinct, like genius of all kinds." Possibly, this may help us understand some of the sounds of Nature although it admittedly evades answering such questions as those dealing with why birds sing, why crickets chirp, why frogs croak and what do songs, chirps and croaks mean to anyone, anyway.

The red-eyed vireo has a good call range.

Bird Sounds

It might be nice to think that all bird sounds were purely expressions at the joy of living. Surely the poets would have us think this. But anyone who has listened to a barnyard fowl knows that the sounds produced are associated sometimes, at least, with an emotional state, but that there are also more practical uses. A mother hen calls her chicks to her. She gives another sound when a hawk goes by. When she is caught before being killed for supper she gives an entirely different sound, and when she is bored with life you can tell it by the sound you hear from the henyard.

Vesper sparrows have a versatile range, while the wood peewee (below) covers a more restricted range.

It is absurd, with all these examples of different sounds associated with different states of mind in a hen, to assume that sounds produced by other birds are limited to any one purpose. It is true that probably the most vigorous of bird songs are those given by the male bird during the time of year when it has staked out and is defending a home territory against the encroachments of rival males of the same species. The intensity with which these defense songs are given varies during the breeding season, being most emphatic at the height of mating vigor. Rather than being a song to please the mate or to win her, it is probable that most songs are given for the purpose of daring other males to come and fight, or in warning them against invasion of reserved areas. With many species of birds, these songs are given from the highest perch available, but this is by no means always the case.

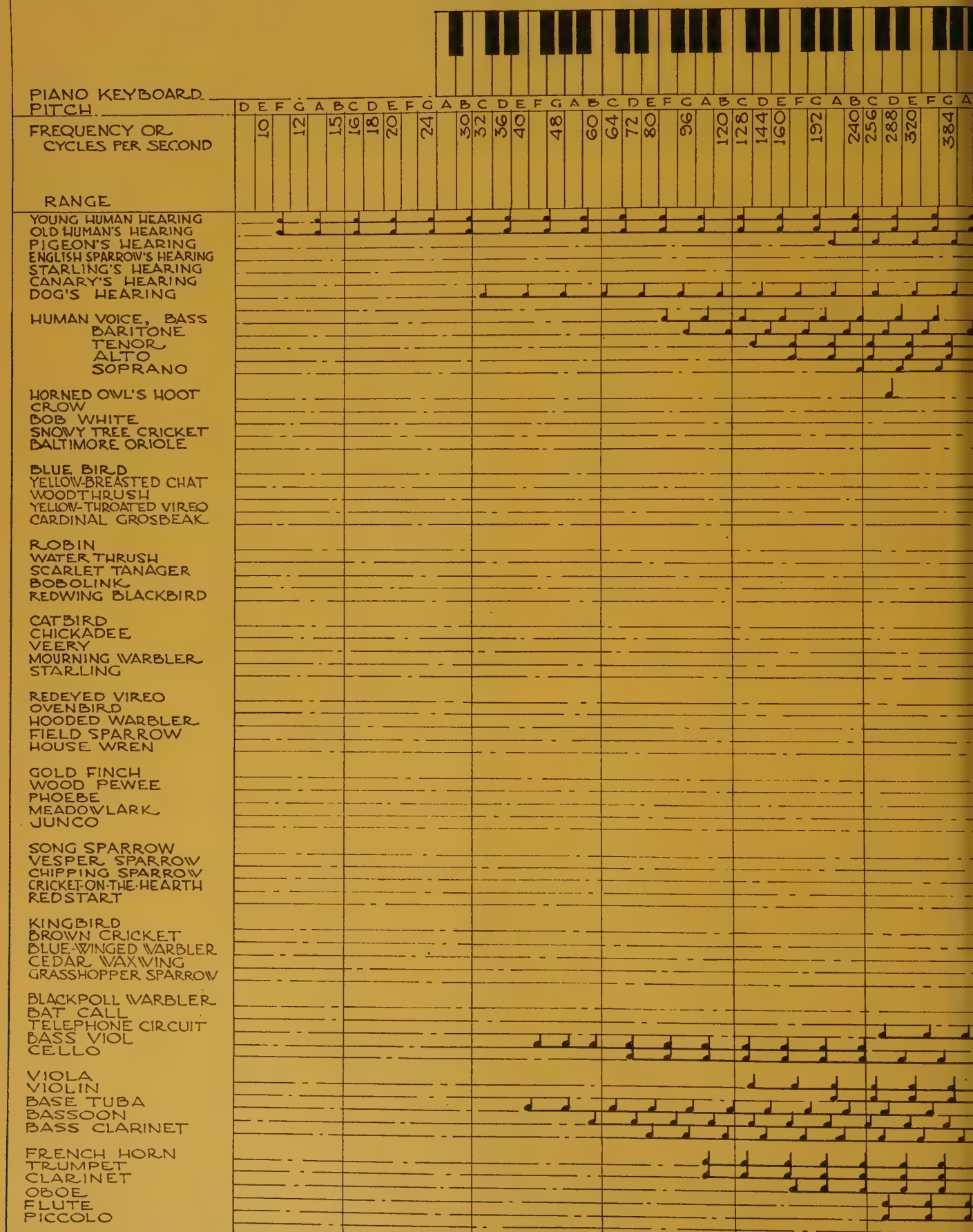
Just as was the case with the mammals, many of the sounds made by birds are not made with the vocal cords. The best known exception is the drumming made by woodpeckers on dead stubs or on metal roofs or even on metal cans. The drumming on the wood might be thought to be secondary and merely associated with seeking food, but this explanation does not help us understand the persistent drumming of a flicker on the metal eaves trough over our heads on an early spring morning.

It used to be thought that grouse produced their booming sound by actually beating the log on which they stand when the noise is made. Then, it was thought that the drumming was made by beating the wings against the body. Motion pictures show us that neither is the case and the wings merely beat the air without touching body or log. The sound is produced by the vibration of the feathers and similar sounds are produced by feather vibrations in other birds. The snipe, the woodcock and the nighthawk are among the other birds that produce sound in this way. Of course quail and pheasants rising into the air also produce a sound with their wings, but this is probably different from the more definite sound produced by the other birds mentioned.

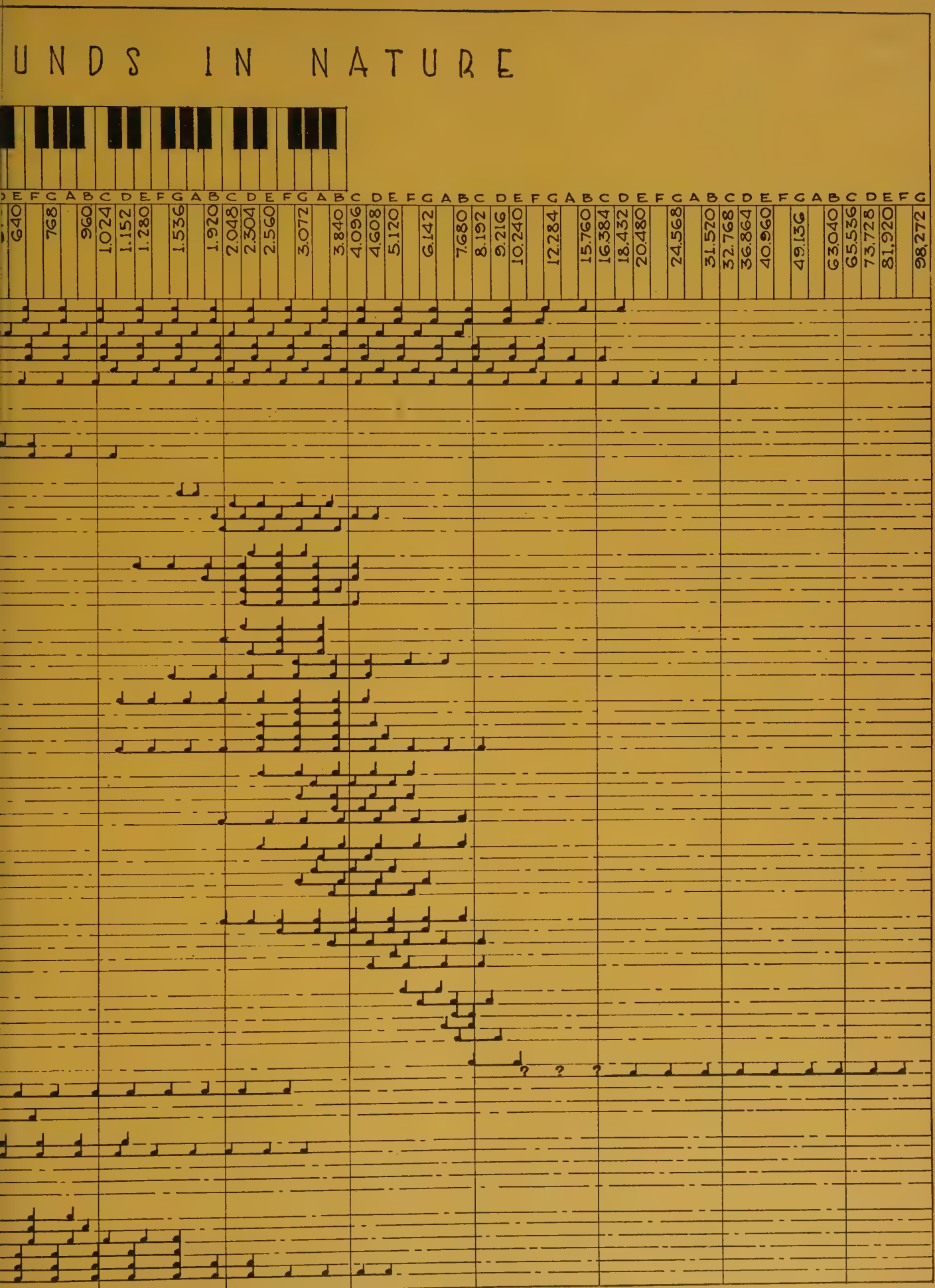
One of the most unique sounds produced by birds is that made by prairie chickens during their courting season when they precede the vocal booming characteristic of them by a pattering beating of the ground with their feet. This has been reproduced splendidly in one of the records of "American Bird Songs" issued by the Comstock Publishing Company and prepared by the Albert R. Brand Bird Song Foundation. With the use of these phonograph records, the important sounds produced by seventy-two North American birds may be produced at will in any home or school room. This offers a distinct opportunity to those interested in learning to recognize these particular sounds as they occur in Nature.

Some excellent studies have been carried on to determine the hearing range of such birds as the starlings, English sparrows, canaries and domestic pigeons, but we need more of them. The techniques for determining this range have been worked out and all that is needed is the patience to follow similar procedures with other species of birds Possibly, when this has been done, we will find that we have made many false assumptions about the reasons why birds sing, and why they produce other noises, and it is altogether probable that the world as experienced by a bird through its ears is a vastly different place from what our ears indicate. We have assumed that the prairie chicken beats the ground with its feet to produce a sound which will affect other prairie chickens, but we do not know if the prairie chicken's hearing range is such that it can even hear itself beat the ground. Certainly, it is doubtful if a canary could

THE PITCH OF S



THE RANGE OF THE SOUNDS OF THE WINTER WREN, SAVANNAH SPARROW, CHESTNUT-SIDED WA



INDIGO BUNTING AND YELLOW WARBLER ARE IDENTICAL WITH THAT OF THE CHIPPING SPARROW.

hear this prairie chicken sound. As indicated at the beginning of this article, we have been content to take too much for granted in drawing conclusions about what goes on in Nature. Here is a chance for those who have an inquiring mind to go on some delightful excursions in experimentation. One of the most interesting papers published in this field is "Auditory Responses of Starlings, English Sparrows and Domestic Pigeons" which was prepared by Albert R. Brand and P. Paul Kellogg. It appeared in the March, 1939, issue of *The Wilson Bulletin*. These men conclude that the hearing range of birds is more limited than that of most mammals.

Sounds From Cold-blooded Animals

Most of us associate frogs with ponds because it is from pond areas that we most frequently hear their croakings. One of the greatest joys a teacher of natural history gets is associated with showing some student a peeper in full song. Most of us can remember with considerable accuracy the first time we ever witnessed the act, and once it has been witnessed hearing the sound brings again a vision of what looks like a little bubble giving forth a tremendous sound.

The calls of frogs and toads are produced for the most part by the males though the females are usually able to produce a sound if necessary. The spectacular choruses of sound are undoubtedly the products of male choruses. Since each species has its own call, one can get some idea of the kinds of frogs and toads to be found in an area merely by listening to them through a season. There is no month in the year even in the northern part of the United States when some frog cannot be heard. In general, the group to which the peepers belong are among the first to be heard. They are followed by the group which includes the meadow frogs, then the toads, and finally the bullfrogs and green frogs.

Literature on the pitch of the calls of frogs and toads seems to be lacking but it seems certain that studies would show that as the season advances from the winter, the pitch of the frog choruses goes down beginning with the high-pitched peepers and ending with the basso-profundo bullfrog.

A number of attempts have been made to learn if there is any coordination between the frequency with which these animals call and the temperature. Most such studies have yielded nothing of importance except to point out that the frequency is more dependent on the readiness of the individual to breed than upon the temperature of his environment. We know that when the first frogs or toads come to the breeding ground in spring the earliest arrivals are the mature males. They are followed by the immature males, and then by the mature females. The immature females bring up the end of the procession; at least this is the case in some species of frogs. It happens that this sequence compares favorably with the sequence to be observed in migrating birds.

It may be dangerous to attempt to correlate the reasons why frogs sing with the reasons why birds sing because there is a correlation between the order in which they migrate. However, it may be that our male frogs and toads are merely cussing out the other fellows of their sex than singing love songs to the female. Some day we may know the answer to this, but if it is known now it is not common knowledge.

While sounds are produced probably by all of the frogs and toads, their relatives, the salamanders are quiet. Many salamanders have what are recognized as hearing organs on their feet but these are more likely to record vibrations in the earth than the sound waves which pass through the air. It is doubtful if these animals have any way of communicating with each other by sound.

The reptiles are for the most part quiet. As exceptions we have the hissing of such snakes as the hog-nosed snakes, the rattle produced by the shaking of the tail of rattlesnakes, and a murmuring sound that some turtles have been known to make at breeding time. The turtle sound has been described as a little like that produced by a tea kettle when the water in it is boiling gently.

When we remember what we have found out about sounds produced and heard by the bats and how the hearing range of dogs and cats and rats is higher than our own, it is foolish to say that turtles and snakes do not make and hear sounds that we cannot possibly hear. We might readily assume that the bats must depend on hearing to some extent because of the elaborate development of their ears. No such development is present in the snakes and turtles. The bats must, when they are in flight, depend upon sounds travelling through the air, while the snakes and turtles remain for the most part in contact with the earth or with water. Sound vibrations pass more readily through earth and water than through the air, so ears might not be so necessary with the animals that remain independent of air-carried sounds.

Hold a pencil lightly between the lips. Scratch the free end with your finger-nail. You will probably hear nothing. Now close your teeth on the pencil. Again scratch it with the finger-nail. This time you should get a distinct sound. In the latter case, the sound is carried through the pencil to your teeth and to the bones of your head to your ears. This use of bony structures to carry sound is probably highly important in such cold-blooded animals as the fish. Sound waves passing through water to fishes are undoubtedly slightly significant to a fish. All this provides a fascinating field for research for the inquiring mind.

Sounds and the Invertebrates

With many invertebrate animals, it is difficult to determine to what things they are sensitive. Particularly is this so with those animals that live close to water and the soil. With these, how can we be sure that the animal hears a sound as we understand it, or feels the vibrations in the earth or water that may accompany the sound waves? Possibly this very difficulty is what has led our psychologists to define sound. When they say sound, they mean "sensations due to stimulation of the auditory nerves and auditory centers of the brain usually by vibrations trans-

mitted in a material medium, commonly air, affecting the organ of hearing especially through the tympanic membrane, or sometimes by internal disturbances affecting the nerves or nerve centers directly." If an animal does not have a tympanic membrane and special auditory centers in the brain he is just out of luck so far as sounds are concerned.

However, there are plenty of invertebrate animals that do respond to sound waves, and some that deliberately produce them with significant effects. We can hear crickets chirp and katydids repeat their calls from the treetops. We can bring tuning forks near spiders or play violins near them to see what they will do. These animals definitely respond to certain sounds in certain ways.

Dr. Frank Lutz of the American Museum of Natural History is one man who does not believe that the crickets should be allowed any privacy in their conversations. Accordingly, he has experimented with them widely. He has had photographs made of their songs on a movie film. He has put individuals together and kept them apart under varying conditions in varying combinations of sex, age and health. Out of his experiments he has come to the conclusion that in general the chirping of male crickets is a matter of defiance of other males rather than an invitation for a date with a member of the opposite sex. By this time, this suggestion should sound familiar because it is obviously similar to what happens with the birds.

The catbird has a moderate range while the hearing of the common pigeon (below) has been measured and reveals a good capacity to hear sounds.

One of the most delightful accounts of insect music is to be found in the Smithsonian Publication, Number 2775, by R. E. Snodgrass. In this bulletin on "Insect Musicians, Their Music and Their Instruments," we find excellent sketches and discussions of the instruments used by common insects in making sounds. We see the location of the "ears" on the legs of many grasshoppers and the location of these ears on other species on the sides of the abdomen.

The photographic records of the songs of some insects show us that the cricket-on-the-hearth chirps at a pitch of E just above the highest key on the piano keyboard. The snowy tree cricket on the other hand chirps in the last octave represented on the piano keyboard and up to D just above the range covered by the piano. This is something you can check in part on your piano. More interesting yet will be your attempt to determine the temperature by the frequency with which snowy tree crickets call. If you will add 37 to the number of calls given in 15 seconds you will be surprisingly close to having the same number as would be indicated on a thermometer placed about where the animal is making its sounds.

It may not be easy to follow the suggestion that you find where an insect is chirping. Again our ingenious Dr. Lutz comes to our assistance. He suggests that one use a doctor's stethoscope with the terminals provided with little funnels. If these are held some distance apart and directed in the general direction of the insect sound and are so adjusted that the sound comes in equally strong over each, the insect will be found at the point towards which each funnel is pointing. This same result can be approximated by asking a number of people to point to where the insect is singing. The pooled judgment will be relatively near to the desired place.

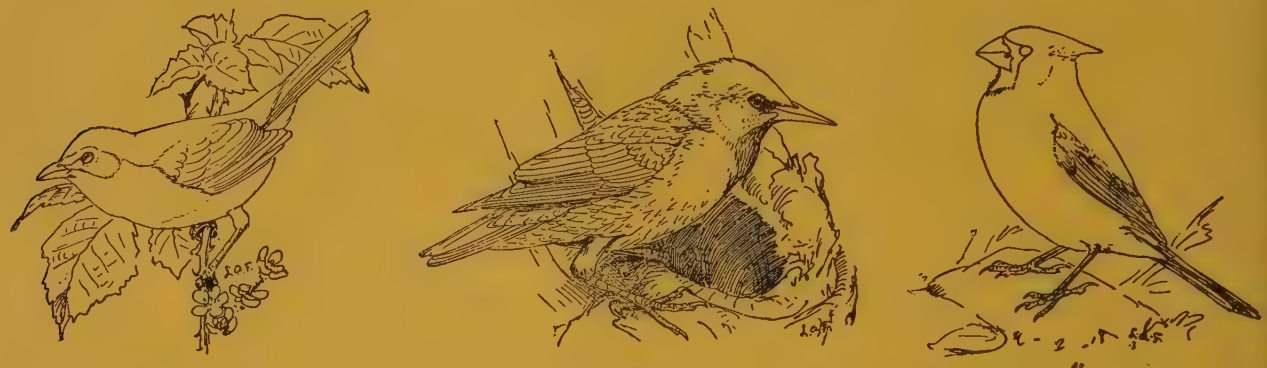
It should be obvious from what has been written that people who are interested in the sounds of Nature usually specialize on definite groups of animals. The psychologists generally confine their studies to the mammals. The ornithologists like Brand, Allen, and Kellogg stick to the birds, and Lutz, the entomologist, sticks to his insects. F. L. Wells of the Harvard Medical School has developed a considerable amount of information about how spiders respond to sounds. He has worked mostly with the common garden spider and has noticed that certain stimulating sound waves make spiders shuttle from one side of the web to another; others induce the spider to spread its legs; others, to seize something and still others to drop from the web to the ground. If you have a tuning fork or a violin, you may enjoy experimenting on your own to see what responses the spiders in your neighborhood make to the sounds you produce for them. You will find the results interesting.

Of course, any discussion of insect sounds should remind us of the significance of different sounds produced by bees and their kin. It takes little training to appreciate how a swarm of bees sounds when it is angered by something. And when it comes to the disturbance flies and mosquitoes can make in buzzing about our heads, we realize that it is fortunate that at least some of the insects that can harm us must announce their visit by a loud buzzing of the wings.

We might go on with this discussion and consider the mechanics of sound production and of sound reception in various creatures. We might review the material found in the science texts on the physics of sound, but there is not enough space. It seems best this time at least to bring together in one article some of the important things we know about sounds as they affect the various groups of animals including ourselves. If there is any one thing we can conclude from the effort, it is that we do not know much about it. We have some knowledge about bats and cats and rats and ourselves, but there must be much that

goes on in the realm of sound in that area of high pitch which is above what can be significant to a sensitive human ear. We need more careful and more simple homely experiments in this field than we have had. Possibly, some will be stimulated by this article to learn if their canaries really do understand "baby talk"; if their dogs can hear the sound produced by striking the lowest key on the piano keyboard; and what note on a violin makes a spider drop from its web. If you do not believe trying these things is fun, then try just one of them as a starter.

•



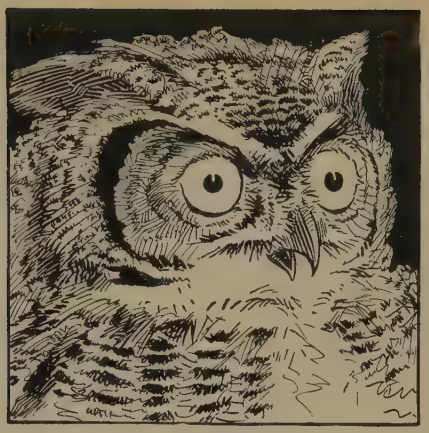
THREE OF OUR BIRD CHORAL SOCIETY WITH VOICES OF VARYING CHARM. THEY ARE THE YELLOW-BREASTED CHAT, WHICH HAS A RANGE OF BETWEEN 1275 AND 4400 CYCLES PER SECOND. THEN THE UBIQUITOUS STARLING, WHICH HAS A WIDER RANGE OF CALL, BETWEEN 1100 AND 8225. THE CARDINAL GROSBEAK FALLS WITHIN A MORE LIMITED RANGE THAN THE OTHER TWO, ITS CYCLICAL BRACKET BEING PLACED AS BETWEEN 2200 AND 4375.

FOUR BIRDS WITH INTERESTING RANGES AND WITH CALLS THAT ARE DISTINCTIVE. THE SONG SPARROW HAS A GENEROUS RANGE THAT LIES BETWEEN 1900 AND 7700. THE REDWING BLACKBIRD'S CALL STARTS AT 1450 CYCLES AND RANGES UP TO 4375. THE BLUEBIRD IS IN A MUCH MORE RESTRICTED BRACKET, ITS CALLS RANGING ONLY BETWEEN 2200 AND 3100. THE MEADOW LARK SEEMS TO TAKE UP WHERE THE BLUEBIRD STOPS AND ITS RANGE IS PLACED AS BETWEEN 3150 AND 6025.

THE GRASSHOPPER SPARROW HAS A RANGE OF 7675 TO 9500; THE YELLOW-THROATED VIREO BETWEEN 2325 AND 3825; THE CEDAR WAXWING A RANGE OF BETWEEN 7675 AND 8950.

As We See It

★



History Repeats

An editorial by Arthur Newton Pack

HISTORY repeats. As in the last war, the peacetime makers of shot-gun and rifle shells, one of our powerful pressure groups, are out again with beautiful colored pictures in the magazine advertisements to show how young erstwhile sportsmen—trained by dawns on the marsh or days in field and forest to bring down the ducks and other game with unerring aim—are now behind the machine guns that shoot our foreign enemies out of the air. And we, the fathers and mothers, brothers and sisters of men at the front, perhaps even experience a glow of pride and relief to learn that the marksmanship of our boys is keener and better than that of Japs and Germans. No longer is it "Ducks Unlimited", but "Japs Unlimited" until enemy planes are gone from the sky.

Not so long ago many of us saw the moving picture "Sergeant York". We recall the scene where young Alvin, winner of the turkey-shoot back in his home mountains of Tennessee, tried his turkey call on a couple of well-concealed German snipers in France and so intrigued their curiosity that they raised their heads to fall victims to the American's unerring rifle. It was the same old trick; the same justification of the sportsman as the ideal American soldier.

We need have no fear that scenes such as these advertisements picture prove that we are wrong in any of our efforts to protect our wildlife. These pictures are but half-truths, and such half-truths have done and will continue to do incalculable harm to our nation. This is the same sort of advertising that continually assures us that all we need is a certain soap, toothpaste or deodorant, and we will be loved and happy; that paints a golden future to be brought about by this car or that refrigerator. It tells us that the answer to every problem is something we can buy with money to go into the pockets of the seller. But if we look beneath the motive and are honest with ourselves, we know that we are deceived; that true happiness comes only from what we do to create opportunity and security for our fellow men.

Powder has furnished the means to kill birds, but not to make them. Powder has given us the weapons to kill off the Japanese and German slaves sent against us by those who wish to destroy freedom and idealism. But all the powder and lead in the world cannot build a civilization so healthy within itself that there need be no more despotism and dictatorship. The only force that can do this is the kind of idealism that creates not merely conservers of wildlife, or other natural resources, but ethical business men and statesmen who place the welfare of all men of every color and race before their own self-interest.

It has been said that when George Washington first stood on the divide of the Alleghany Mountains and looked to the west, he wrote that Providence must have laid a new and great responsibility upon a people to whom it had given so great a heritage of natural riches. How have we lived up to that responsibility?

We as conservationists are rightly proud of our battles to save our wildlife. We have not opposed all hunting, and we would not, any more than we would refuse to live in a wooden house because trees had to be cut down in order to make the lumber. We stand sim-

A Boy's Birthright

By FLETA BRUER GONSO

I'd rather give a boy a dog,
To know its love and care,
Than give him all the toys on earth,
And leave his small heart bare.

I'd rather give a boy a stream
To follow all day long,
Than show him all the highest towers
Without a wild bird's song.

I'd rather give a boy a wood,
To wander in at will,
Than show him myriad city streets,
Where flows no beckoning rill.

The birthright of a boy's a dog,
A wood, a winding stream,
The song of birds, a climbing trail—
And in his heart, a dream!

ply for the rights of all men, and we believe with Washington that the greater our blessings the stronger our obligation to keep and conserve our heritage of natural riches, not merely for ourselves, or even for our own generation, but for its wise use by all men who may dwell upon the earth.

And if we are conservationists, and do indeed honestly believe as we maintain, does not our obligation go further than to birds and trees and fishes and soil? Does not America need our philosophy interpreted in broader terms? The world looks to America as the last best hope of freedom for men. The world is fighting against the very thing that we have fought against. It is fighting the idea that ideals have no meaning, that opportunism and the power to grab for self or nation is all that counts. With the coal that lay beneath the feet of Washington, with the iron that was hidden beneath those hills and valleys of the West he looked upon, with the trees and the soil and the strength of our manhood, our armies and navies will win over the enemy guns. But that is not enough. We will never truly win peace until we also face the fact that we are really fighting selfishness wherever it may be, that our worst enemy is the denial of idealism itself. The greed of politicians and bureaucrats who seek personal power alone, the grasping of business that believes itself beyond humanity and moral compulsion, the vindictiveness of labor leaders, the mad self-interest of countless pressure groups—all are manifestations of the same evil force that created a Hitler and can recreate him in another and even more terrible form. If we want for our children's children birds and fishes, clear streams and beauty unimpaired, how much more do we want for them security, peace and happiness?

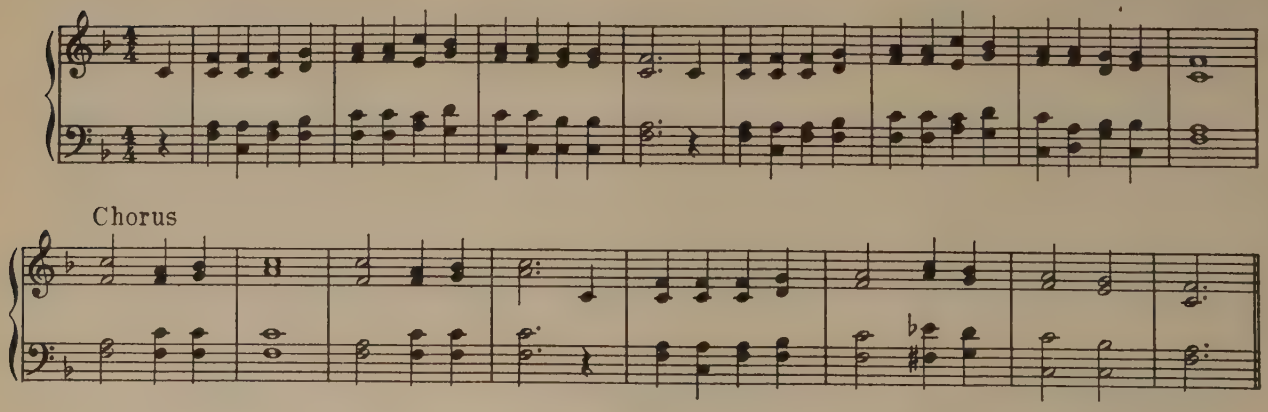
It is not enough for us to fight only for wildlife or other natural riches. We must win not merely over the destroyers of Nature but over the devastators of the divine spark of human nature—over all those peoples throughout the world whose smug complacency in what they claim to be their vested rights and privileges threatens injury to their fellow men of any race or color. We are idealists. Let us no longer be ashamed to voice our idealism, but stand forth actively among our neighbors, our friends and our enemies as opposed to injustice and greed wherever it may be found. By so doing we will conserve civilization.

★

The Porcupine

Words and music by GRACE KEIR

Reproduced from "Songs of the Open" by special arrangement with the publishers, Carl Fischer, Inc.



Oh, little wood friend porcupine,
You're not afraid a bit;
My dog he shows his teeth and snarls
But there you sit and sit.

Though you've a quilly tail and back—
You're quills can't shoot at us,
But when we get quite close to you,
You strike without a fuss.

Your quills have barbs that inward point,
It's hard to pull them out,
But now my dog will keep away
When porcupine's about.

Chorus:
Down goes your head
Up goes your back,
You'd slap us in the face
With your tail, "Smack! Smack!"

Note:—When the children sing "Smack! Smack!" they slap each others hands.

Handsome birds, the murderous habits of the shrikes make them—

Ogres of the Prairie

By H. H. PITTMAN

The white-rumped shrike, the sub-species found in southern Saskatchewan. It is a striking bird, but one whose habits are particularly destructive to small song and insect-eating birds during the nesting season.

HANDSOMELY-MARKED, medium-sized birds, the shrikes or butcherbirds are found in all the wooded areas of the prairie of Manitoba and Saskatchewan, and throughout the timbered country as far as Alaska. They are bold and fond of surveying the countryside from the telephone wires, and can generally be seen along the highways in the southern parts of these provinces during the summer. The broad roads make good hunting grounds, and beetles or other small creatures are conspicuous and easily caught upon the gravel. Unfortunately the characters of these birds are not in keeping with their appearance, and many a feathered mother must correct her wayward offspring with the threat that "the butcherbirds will get you if you don't watch out!" They are the Jekylls and Hydes of the bird-world and their bills are not notched and toothed without reason.

Although the shrikes are not included with the raptorial birds they have several of the characteristics of that group. There is a Chinese shrike that is particularly destructive to caged birds exposed in the gardens there. The common South African shrike, *Lanius collaris*, is a deadly enemy of caged canaries, apparently attracted by their bright colors. The latter will readily enter houses, regardless of the presence of human beings, and kill birds through the bars of the cages, exhibiting a truculence and ferocity unequalled among birds of this size. Like the birds of prey, shrikes also have the habit of disgorging the indigestible parts of their food in pellets.

Only two species of shrikes are found in western Canada, the northern and the loggerhead. The latter frequents the southern parts of the Dominion and has been divided into several sub-species. The one common to southern Saskatchewan is known as the white-rumped and may easily be distinguished from the larger northern shrike by its plain white breast. Northern shrikes as a rule are seen on the plains only during migration and although their coloration is very similar to that of the loggerheads, they can always be recognized by the fine wavy lines or vermiculations that are easily seen on the underparts of their bodies.

The shrikes are passerine or perching birds, and, unable to hold their prey while tearing it to pieces, they have acquired the habit of impaling it on thorns or hanging it in suitable forks among the branches. The same bush is used repeatedly, and sometimes quite a "larder" of small birds, young mice and insects accumulates. The northern shrikes almost invariably

The white-rumped shrike at the nest. The young birds, usually seven in number, are tightly packed into a deep and cozy nest, but nevertheless are able to move about. Flesh forms a major part of the food brought them.

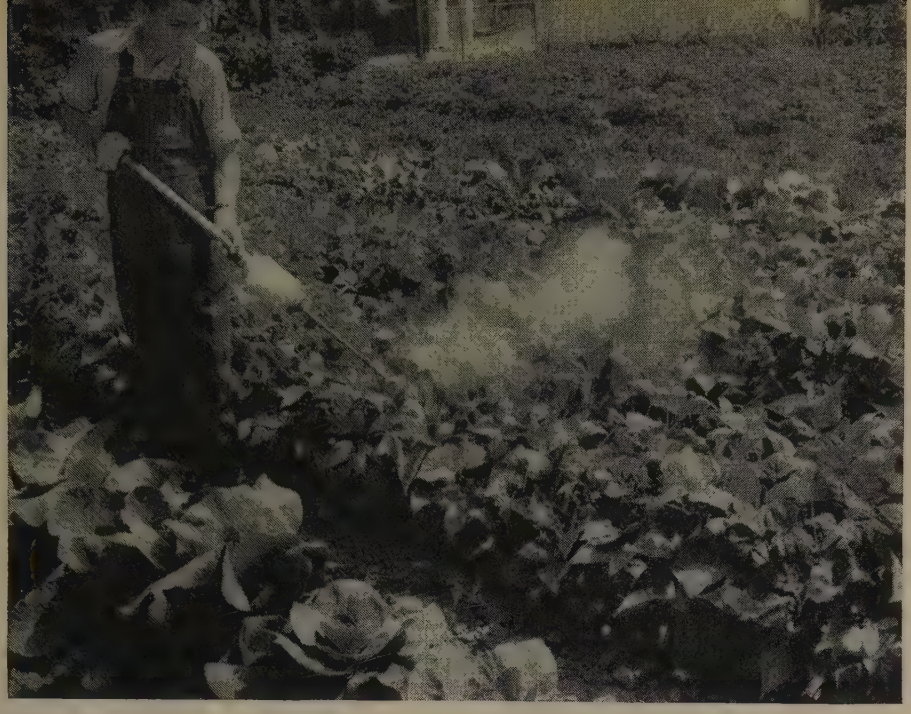
make larders during the nesting season, but the habit is not so well developed among the loggerheads and I have never found more than a few beetles in their collections. However, a friend reports the discovery of a larder near Hartney, in southern Manitoba, containing several fledgling birds.

During two days spent photographing white-rumped shrikes in Saskatchewan I noticed that, on an average, three times out of five flesh of one kind or another was brought to the nest. After the cameras were placed in my hiding-tent the first bird to return brought part of the body of a newly-hatched yellow warbler or sparrow. The next one brought the heart! Occasionally a caterpillar was given to the chicks, but during all the time I had these birds under observation, flesh formed a large proportion of the food brought in. Sometimes a grasshopper was carried but this did not happen often.

A dead willow about twenty feet away was a favorite resting place and the shrikes frequently settled there for a few moments when approaching the nest. They are fond of a commanding perch, and, like the kingbirds, may often be seen sitting on a conspicuous dead branch. Their flight is direct although the rapid wingbeats sometimes give it a rather labored appearance. Deciding upon a twig it wants to reach, a shrike will fly directly to it in a straight line from any distance—a habit that often helps to identify the bird when only seen in silhouette.

In southern Saskatchewan white-rumped shrikes commence building late in May, generally choosing a thick bush or thorn thicket. Once I would have written "invariably" instead of "generally" but I recently discovered a nest most conspicuously placed in a dead willow. The nest itself has a foundation of twigs, weed-stems and occasionally odd pieces of string. A layer of dead grass and fibers of various kinds comes next and finally a lining of sheeps' wool, cow-hair, feathers and horse-hair felted together, making a deep and very cozy structure.

Seven eggs are laid, and these sometimes show a tendency for the markings to form a zone. How the youngsters find room is hard to say, for they are packed in like sardines, but they stay in the nest until fully fledged. Although apparently wedged tightly, they move around in the nest and usually face the direction from which the (Continued on page 105)



Too young for the armed services, Richard Holter puts on a poison dust barrage against the Japanese beetles that infest his Victory Garden as the Japs do the island jungles of the South Pacific.

Victory Gardeners Make History

By ANDREW S. WING

THAT democracies are slow starters, the tragedy of Pearl Harbor might indicate. But they are strong at the finish line. We were just as slow getting started with our food campaign as we were with guns, ships and airplanes. In spite of that, our farmers harvested the greatest crop in history, and our gardeners took from their home plots the noblest lot of vegetables and fruits this country has ever seen.

H. W. Hochbaum, who has charge of the Victory Garden program in Washington, has conservatively estimated the number of farm gardens at 5,000,000, with 10,000,000 more in towns, cities and suburbs. If each of these gardens produced an average of $50 worth of food, it would total $750,000,000, which, as the saying goes, is not exactly "hay." Undoubtedly nearly a billion dollars' worth of good home-raised food aided family budgets and released fresh vegetables, fruits and canned goods for the armed forces and for lend-lease shipments.

Successful as was the 1942 Victory Garden program, it was just a dress rehearsal compared to what will be done this year. Looking backward we can see now that much more could have been done had we realized how soon we would face actual food shortages and rationing. But the 1942 results were decidedly worth while economically and in helping to maintain civilian health and morale on the home front. Work in the garden often provided men and women the needed change and relaxation. To ardent Victory Gardeners every weed symbolized a Nazi to be mowed down, while little imagination was required to arouse one's wrath against Japanese beetles and other alien pests. Harvest-time brought a sweet sense of victorious accomplishment to the hearts of millions of plain dirt gardeners. A task that before may have been tiresome and humdrum had a new significance.

Various lessons and results of 1942 bear on the 1943 campaign. On the whole the farm gardens were larger and more productive than the urban gardens, and there were more of them in proportion to the population. Thrifty farmers grow a garden as a matter of course, although there still are an unfortunately large but diminishing number of farm families that choose to eat out of tin cans or whose main ration is corn meal, salt pork and molasses.

Federal and state agricultural leaders for years have been preaching the gospel of a garden on every farm, both for economy and nutrition. But until the war started it had not seemed worth while to encourage urban gardeners to grow their own food. Fruits and vegetables were plentiful and cheap in season, and with farmers bothered with surpluses, there seemed no need for city people to grow food. It was thought better for them to putter around with flowers, and buy their vegetables from the men who made a living growing them. So an army of real gardeners were busy in town, city and suburb, concentrating on roses, irises, dahlias, annuals, rock gardens and such rather than such prosaic things as cabbages and tomatoes. But they had learned how to make things grow. Indeed, a lot

It is a family affair, this business of growing a Victory Garden. Little Agnes Weeks is glad to lend her mother a hand in harvesting some of the cabbages in their garden.

of these back-yard gardeners knew better how to garden than did many farm people who did not consider a kitchen garden as a vital part of the farm operation.

Before the snows disappeared a year ago seedsmen were filling orders for what turned out to be their greatest season in all times in both vegetables and flowers. The all-powerful instinct of self preservation that motivates the human race in war-time appeared. By June, it was plain that gardeners had heeded the call to produce. While there were some inevitable failures from inexperience, bad weather, insects and diseases, there were few gardens that did not pay rich dividends for the time, labor and materials expended.

As a member of the National Advisory Garden Committee I worked with the Victory Garden program from its inception. I have seen reports on the gardening activities in most of the states. With few exceptions these reports are good. Some states put on all-out campaigns, others were more moderate, while a few told gardeners, in substance, "Seeds, fertilizers and insecticides are scarce. Better grow flowers and let the market gardeners grow the vegetables."

This year it will be a different story. Housewives who are pinching pennies to buy carrots at fifteen cents for a bunch of three, and who have watched one shortage after another develop, while prices mount and quality declines, will march out into the backyard to grow their own.

Last year, however, there was good organization work in many states. County agents rubbed elbows with garden club ladies in slacks, and trim A.W.V.S. workers helped organize groups, or worked in the fields harvesting alongside Negro and Mexican laborers. There were also plenty of gardens planted by people who merely responded to the advice that "a Victory Garden is any kind of a garden that will help win the war."

There were many high spots in the 1942 picture. Extension specialists at the Ohio Agricultural College estimate that there were 586,000 Ohio Victory Gardens, of which 286,000 were in towns and suburbs, 220,000 were on farms, 29,000 were community plot gardens, and 51,000 were school gardens. In Franklin County (Columbus) 1250 community gardens yielded 10,000 bushels of tomatoes, 30,000 dozen ears of sweet corn, 4500 bushels of beans, and 900 tons of cabbage and other leafy vegetables. Which is considerable garden sass!

New York State normally grows a lot of cabbage, potatoes, celery and other vegetables for market, but that did not keep the folks at Cornell from putting on a strong Victory Garden program. Each county used its 4-H Club leader as a coordinator, and a series of excellent leaflets were sent out in season to all who were interested enough to request them. Nearly all of the 153,000 farms had gardens, and Arthur J. Pratt of the New York State College of Agriculture estimates that the gardens totalled at least 300,000. This year he thinks the figure may reach at least 500,000.

Kansas is more noted for its wheat farms and cattle ranches than for gardens, yet its farm gardeners turned in an increase of 60 percent instead of the 35 percent that was hoped for—a mark for some of the more favorably-located states to shoot at.

One of the best all-around garden programs was staged in Delaware. Not a trick was missed by Mrs. William S. Dutton, state chairman, and her cohorts. A garden center in Wilmington supplied literature

Jane Holter sets out pepper plants in her Victory Garden in Maryland. Onions that were planted earlier from sets are thriving. English housewives miss onions most.

and information, and similar centers were established in every county with branches in each community. Countless questions were answered by phone or in personal interviews. Every organization in the state was asked to sponsor a Victory Garden and many of them did. Radio and newspaper publicity, lectures and garden schools stimulated interest. Boys and girls were reached through the Boy Scouts, Girl Scouts, 4-H Clubs, and the Future Farmers of America. Five Victory Garden Harvest Shows were held in the fall, at which quantities of fine vegetables and fruits were shown. Outstanding work was rewarded by the Governor in the form of a certificate of merit. In each case the winner was a young gardener with little or no previous experience. Surplus produce was canned, and surplus canned goods were stored in food banks at Red Cross Canteen Service centers designated as evacuation points in case of air raids.

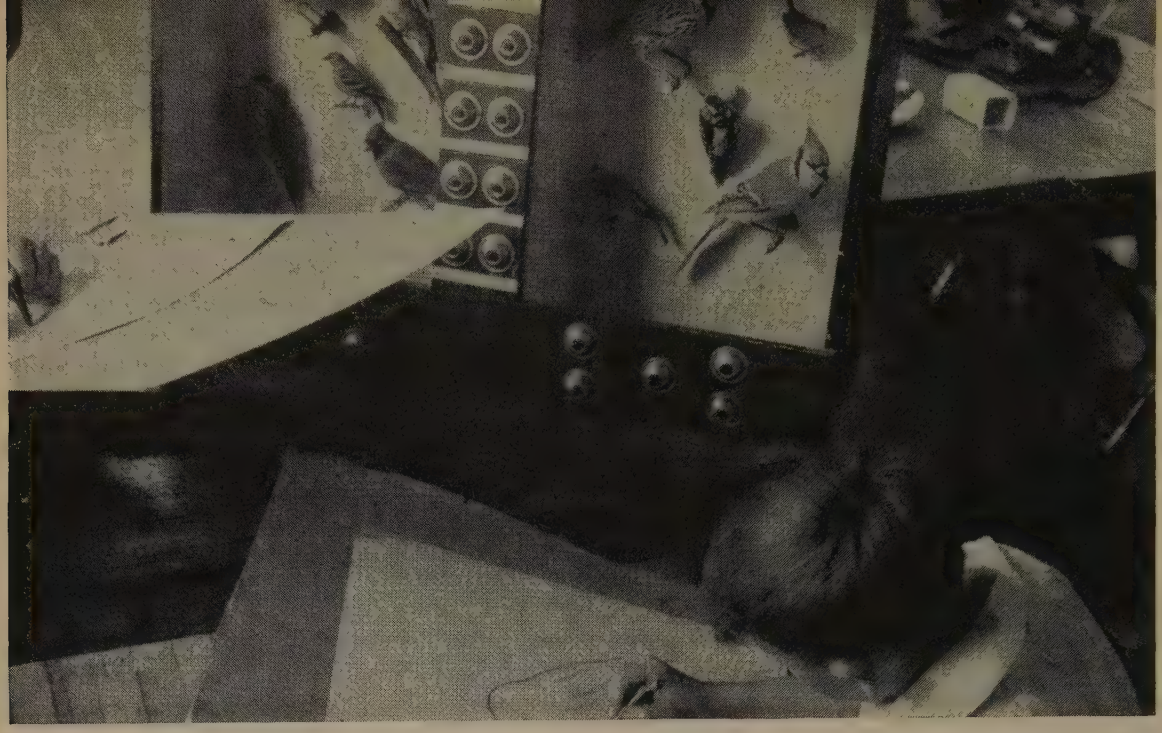
Good reports rolled in from Oregon, California, Indiana, Michigan and other states. Some of the best work was done in South Carolina and Tennessee, where live-at-home farm programs have been in operation for several years. While these programs have been aimed primarily at farmers, with emphasis on low-income, undernourished groups, the programs are being broadened to include all those in towns and urban areas who can grow gardens. No more malnutrition is the goal of agricultural and nutrition leaders, who have been shocked by disclosures of physical defects in selectees caused by improper food habits. It is their aim to wipe out pellagra and the other dietary diseases by encouraging and helping the people in the low-income groups to provide themselves with vitamin-rich vegetables and fruits that they can easily grow at home or in some nearby garden plot.

Of the big cities, Chicago claims, and probably deserves, first place for staging a bang-up garden campaign. An aggressive group of citizens was enrolled by the Office of Civilian Defense and headed by George T. Donoghue. Tractors and other machines were made available by farm machinery houses, and the black dirt literally flew in every vacant lot and field all the way from the smoky Loop out into the surrounding suburbs. A total of 200,000 Victory Gardens were planted, and, if the pictures tell the true story, the harvest was splendid.

The school garden movement received a great stimulus and in many communities the produce of the school gardens went into cans for the school cafeterias. One of the finest school garden exhibits I saw was a display of canned goods and produce from a grade school in Greenwich, Connecticut. In many communities Boy Scouts vied with Girl Scouts and Camp Fire Girls to see who could grow the best carrots, corn and cabbages.

The amounts of home-grown produce that were canned and stored were prodigious. Exactly how many jars of vegetables and fruit were put up no one knows, but the Bureau of Home Economics estimates that farm and rural people alone canned the equivalent of three billion quarts of food. Each can or jar is a two-way projectile aimed at the Axis. It releases food for the Army and Navy and for hungry people abroad; makes healthier, happier people here at home.

For 1943 the program will be greatly intensified. Secretary Wickard has set the farm goals so high that farmers will have to strain (Continued on page 104)



The birds in the traveling cases not only serve for identification but also as models for the children in the art classes. Thus the program serves several useful school purposes.

In Virginia school children play a new study game called—

Button, Button, What's the Bird?

By TALBOTT E. CLARKE

"It's a strawberry bird," declared the newsboy, cradling the crippled bird in his hands.

"Naw, it's a lady cardinal," chorused his six pals.

"I know it's a strawberry bird 'cause my pa says so," he insisted.

"It's a cardinal. I know 'cause our teacher has taught us a few birds," said one of the six, belligerently doubling up his fists. The others agreed, and were ready to fight about it if necessary.

Bloodshed was averted when one suggested that they take the bird to the office of the Forest Supervisor of the George Washington National Forest in Harrisonburg, Virginia, the scene of this incipient urchin battle. There the bird was identified as a "lady cardinal", leaving one youngster shamefaced at his Dad's ignorance; the rest jubilant.

His dual function of peacemaker and bird authority left the forest officer with a problem. He had gathered that some school teachers, lacking in both time and teaching material, had introduced bird study. He decided to find out, and discovered tremendous interest and a vast lack of material. The results of several weeks of fact-finding were laid before the Forest Service and the Virginia Commission of Game and Inland Fisheries. Both agencies saw the seed of interest in wildlife conservation in bird study in the lower grades.

A collection of study skins was prepared on the Forest. These covered 120 species, and, in glass tubes, started a tour of schools in a specially-constructed case. Pessimists predicted that the collection would not last one school term, but after being used by 65,000 students in actual bird study, and as an exhibit at fairs, it was still in serviceable shape.

At the end of a two-year period, the collection of skins had created a seemingly insatiable interest in bird study, from kindergarten to college. The skin collections could not meet the demand. Teachers suggested that better coverage could be obtained by breaking the large collection into smaller units. Several teachers asked if it would be possible to provide a few standing mounts. At that time the idea of standing mounts traveling in cars, or in the back of Forest Service pick-up trucks over mountain roads, seemed fantastic. However, as time went on and student enthusiasm continued to grow, a sample collection of standing mounts was developed. Ten birds were arranged in two sections, five in each side of the case.

Students would study the birds in the case, then

Bird skins in glass tubes were first used and still serve advanced students, but the traveling cases have proved most successful with the younger students.

push two buttons, one corresponding in position to that of the bird, the other beside a label with the bird's name. If the bird and its name are properly matched, a concealed buzzer, operated by dry cell batteries, sounds, much to the delight of the pusher. Silence brings chagrin.

The first units resulted in the development of ten grade school units covering one hundred species of birds. Public subscriptions financed them, with particular assistance from the organized sportsman and bird-study groups.

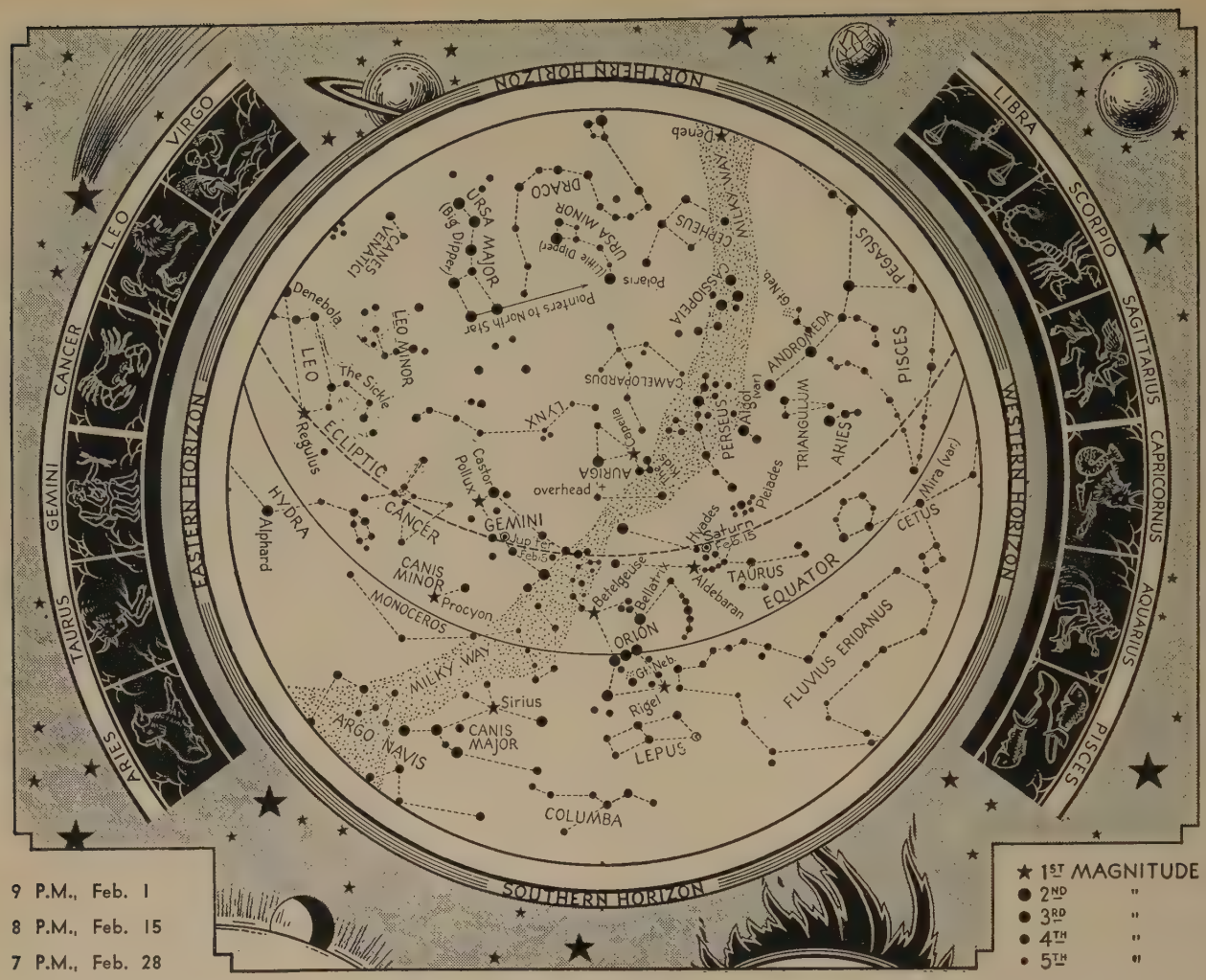
Distributing the units involved transfer from school to school, covering a schedule of more than one hundred schools within a school term. This was worked out in cooperation with the county game wardens, who provided the necessary transportation. Although this was, at times, an extra burden, it had its by-products. Game wardens found an opportunity to meet and know the grade school children as a friend and not the big bad wolf he was labelled by law-breakers. Many game wardens seized the opportunity to carry broader conservation thoughts into the school. Forest Rangers had similar results, and were constantly being asked to tell about forest fires, their control and their effect on the lives of the birds that the children now knew and for which they had gained greater solicitude.

These bird collections raise one question in the minds of bird lovers—what effect do these collections have on the normal proclivity of the American boy to use his B-B gun as a means of checking the identity of the song bird perched in the top of the highest tree in town? The answer to this question was gathered by the cooperating wardens. It was found that even the worst boy in town had developed an entirely different interest in song birds. One youngster said: "I would like to see someone just try to kill a bird, especially the grackles, which walk around like they have their hands in their trouser pockets." This attitude toward birds in general seems to prevail throughout the area in which these collections are in use.

The extent to which the collections are used varies between schools, the variation being attributed to the extent of personal interest of the individual teacher. In one town of about 5000 population, three collections received about 24,000 hours of student use during a period of one month. The importance and use of the bird collection in many schools compares favorably with the importance of art study periods and similar activities. In fact, bird study is sometimes combined with art study.

In many schools, where (Continued on page 109)

Punching the buttons. Children push one button corresponding in position to that of the bird, and one beside a label with a bird's name. If the buzzer sounds the choice is correct.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

November Nova Fades Away

By ISABEL M. LEWIS

Nova Puppis, the most brilliant nova to be seen in the heavens since Nova Aquilae appeared on June 8, 1918, was first discovered by Dr. Bernhard Dawson, an American astronomer of the University Observatory, at La Plata, Argentina, on November 8. The star was discovered independently in the United States by Dr. Edison Pettit of the Mt. Wilson Observatory on November 10, and by Dr. A. D. Maxwell of the University of Michigan Observatory on the morning of November 11, before the news of its discovery in Argentina was received. It appears to have been, at the time of its maximum brightness, almost as brilliant as Canopus, although Dr. Pettit found by an accurate measurement of its brightness, made shortly after he first observed it on November 10, that it was about as bright as Rigel, in Orion, which is more than half a magnitude brighter than a standard first magnitude star, such as Aldebaran.

In the United States, Nova Puppis was, at the time of its discovery, visible in the morning sky near the southern horizon. A line from Sirius extended in a southeasterly direction to the small triangle formed by three second magnitude stars in the southern part of the constellation of Canis Major, and, prolonged about as far again, would indicate the approximate position of the star in the constellation of Puppis, The Stern. This is one of the minor constellations into which the huge southern constellation of Argo Navis, The Ship Argo, has been subdivided. It lies directly in the path of the Milky Way and contains no star brighter than the second magnitude star, Zeta, near which the nova burst forth in last November's skies.

The splendor of Nova Puppis—like that of most novas—was extremely short-lived. Its decrease in brightness was steady and rapid. In the five days between November 12 and 17 it lost nearly two and a half magnitudes in brightness and became a star of second magnitude. In the next five days it dropped to third magnitude and by December 1 it was scarcely visible to the naked eye.

It is possible that, even before this is in print, Nova Puppis may recover for a short time some of the brightness that it is losing so rapidly, for that is characteristic of many novas. An eye will be kept on Nova Puppis telescopically for some time to come and with this in mind.

One of the most remarkable facts about Nova Puppis is that an examination of photographic plates covering this part of the heavens have shown that no faint star was visible prior to the outburst, in the position where the nova now appears. This means that the star must have been normally fainter than the faintest stars that appeared on the photographic plates and some of the plates examined showed stars down to eighteenth magnitude. This means that the star increased at least 17 magnitudes or 6,000,000 times in brightness. Its distance from the earth is probably very great, several thousand light years at least. This enormous increase in brightness at the time of its outburst suggests that it may be a supernova, which would be about ten thousand times brighter than an ordinary nova. They, in turn, are on the average about ten thousand times more luminous than the sun. If the sun, an average nova, and a supernova, were all at the same distance of 33 light years from the earth the sun would appear as bright as a faint star of fifth magnitude; the nova would be more than twice as brilliant as Venus, while the supernova would give far more light than the full moon.

Up to the present time more than 30 supernovas have been discovered, all of them in external galaxies such as the Great Andromeda Nebula, and it is a strange fact that in some instances the supernova has outshone the galaxy in which it appeared. Whether a supernova has ever appeared in our own galaxy is not known. It is possible that either Tycho's Star or Kepler's Star may have been a supernova. No novas as brilliant as these two have ever appeared in the heavens up to this time, and it is remarkable that they appeared within 32 years of each other. Tycho's Star, so called because the great Danish astronomer spent so much time in observing it, appeared in 1572 in Cassiopeia. It was more brilliant than Venus, could be seen in broad daylight for some days, and did not disappear from view for more than a year. Kepler's Star appeared in 1604 and was as bright as Jupiter for some weeks. It was discovered in October, 1604, and was visible to the naked eye until March, 1606. There have been 72 novas discovered in our stellar system since 1900, and this is probably but a small proportion of the total number that have flashed forth, but have been too distant from the solar system to be seen. Most of those that have been discovered were faint even at the time of their maximum brightness. The brightest nova to appear in the heavens since Kepler's Star of 1604 was Nova Aquilae, 1918, which became nearly as bright as Sirius.

The cause of the outbursts of novas has long been a mystery. It was at one time thought the outburst was caused by an encounter of a star with a nebula, or by the close approach of two stars. It is believed now to be a result of some disturbance within the star itself that produces a rapidly expanding shell of gases which travels outward from the star with velocity as high as a thousand kilometers a second. In many instances after an interval of a few years the star returns to its normal brightness. It appears that, in these cases, the star is not greatly disturbed by its outburst, which seems to be of a superficial nature. All novas do not behave in the same manner, however. Some novas explode more than once; others become variable stars; still others acquire permanent nebulous shells. It is suspected that only certain types of stars, the white dwarfs, indulge in these outbursts. These stars are very heavy for their size and some of them have a mass twice that of the sun packed into a globe not much larger than the earth. They have extremely hot surfaces, and may be more subject to the conditions that produce these explosive outbursts than other stars. Whatever the cause the disturbance seems to be no more than skin deep, as a rule, and the star generally returns with little permanent loss of brightness to its earlier state.

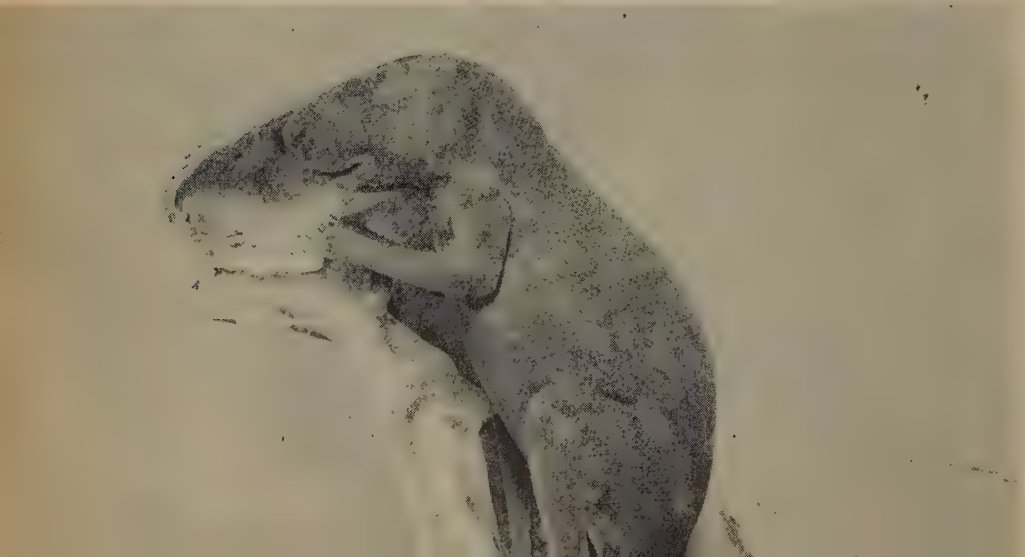
There is to be a total eclipse of the sun this month. It will occur late in the afternoon of February 4 in the extreme western part of the United States and Canada, where the sun will set partially eclipsed. The path of total eclipse will pass over the Seward Peninsula, and towns in that region, in the afternoon, and will leave the earth at sunset in the extreme northeastern part of Alaska. The total phase will be short, at most not more than about 158 seconds.

A partial eclipse of the moon will take place on February 20th and will be visible over all of North and South America, most of Europe and Africa, the eastern and central part of the Pacific Ocean, and the Atlantic Ocean. At greatest eclipse (Continued on page 104)

COMPANIONSHIP

By OSCAR OSTLUND

No trail is lonely,
And good company is near,
If forest leaves are breathing in your face.
No darkness can erase,
Or canopy of timber hide
Your way. It will be clear—
If through the foliage there be
An aisle in which two stars shine visibly—
Two pointers forward in the Dipper's side.



Rukupi, Rare Rodent

By W. E. EIGSTI

★

The author starts work on the rukupi model. Clay is applied to an upright core supported by an iron rod. Bones carved from wood are used in the legs, and strongly wired in place. Around these the muscles are modeled.

Then comes the clay model made to the size of the already prepared skin. It took three weeks to complete this model, after which a plaster mold was made, which gave the negative.

Into the negative mold go the burlap and plaster that make up the manikin. Three layers of burlap are laid in the mold and semi-liquid plaster is rubbed and worked into these. This sets, is removed and shellacked, and the glass eyes are put in place.

The taxidermist then applies the skin of the animal. It is put on wet and is cemented on. This makes the skin adhere closely to the manikin, even in the hollows. The skin is sewed together with strong, fine thread, and the specimen is then allowed to dry.

The completed specimen is resplendent with the whiskers, which had been removed to avoid breakage while the skin was being tanned. Any loss of color through tanning has been remedied, and the finished animal is ready for exhibition, either by itself or as a part of a habitat group to be constructed later.

THE first specimen of this remarkable rodent was taken in the Montana de Vitoc in the Andes of central Peru. It was given to the Museum of Warsaw, and a little later, in 1873, was examined by Wilhelm Peters of the Berlin Museum and was named *Dinomys branickii.* From the characteristics that separate it from its nearest relatives, the agoutis and the pacas, it has been placed in a separate family—the Dinomyidae. A large specimen may be nearly three feet long, including the tail. The generic name, which means terrible or powerful mouse, is in allusion to its size. The chief characters separating it from its closest relatives are the possession of four toes, instead of three or five, a deeply-cleft upper lip, very long whiskers, and a tail about one third the length of the body. There are also numerous differences in the skulls.

Little has been learned about the habits of the rukupi by observations in its haunts, except for fragments of information gotten from the natives. In captivity, the animals become gentle and affectionate, and much is on record concerning individuals that have been studied in the zoological gardens at London and Hamburg, and, in this country, at New York and Chicago. The rukupi is slow of movement, fearless but docile. When handled it gives a squeaky sound of satisfaction. It approaches a person with a similar sound, as though it had something to tell. It walks with its back horizontal to the ground, rather than arched, as with the pacas. It feeds on melons and various fruits of the palms, and eats like a squirrel, holding its food with its fore-paws. Its incisors are sharp and strong.

Edmund Heller, who brought back from the Andes the specimens that formed the basis for study by C. C. Sanborn of the Field Museum, obtained them mainly from the natives of the upper Huallaga, tributary to the Amazon. The following paragraphs show how difficult it is for even a trained zoologist to obtain specimens of this rare rodent, and give a clue to conditions that contributed to the slow advance of our knowledge of its range and habits. We quote, in part, Heller's account published by Sanborn (Pub. 296, Zoological series, Field Museum, Vol. 18, No. 6, p. 153):

"*Dinomys* . . . is not a fighter but merely fights as a last resort to save its life. It is slow in motion and can not turn about quickly, therefore it has no rear protection from alert foes like ocelots, tayras, coatis, etc. It therefore lives in rocky cliffs, or holes in the ground by preference, where it can back up and secure rear protection. With its large teeth it can fight any ordinary enemy. Dogs are used to trail *Dinomys,* I believe. Although I spent several months in *Dinomys* territory, and was taken by local guides to cliffs where *Dinomys* had been secured, I never met one of these rare rodents nor did I ever find a burrow or little cave where they had recently lived. My pet *Dinomys* followed me closely everywhere I went, and at night slept under my bed. She had a firm belief that her safety lay in keeping at my heels. She had no home feeling for any cabin we occupied. When alone she was always worried and full of fear, apparently." (Continued on page 104)

The School Page

By E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

SOUND SUGGESTIONS

SPEAKING of the beginning of life, the poet says, "Birth signified by a cry." Speaking of the other end of the journey, the gangster tells of "croaking" his rival. Between the two extremes, we are reputed to let out "squawks" about this and that.

While we use these "sound effects" along the trail of life, most school programs religiously avoid consideration of sounds, at least until the upper grades. Then the subject is presented as the driest imaginable paraphrase of the academic treatment given the subject of sound in our books on physics. While the school program calls for an academic discussion of whether a given organism is a plant or an animal, the children engage in surreptitiously carrying on communications in school by sounds, and they make the welkin ring with their shouts when they are freed from the disciplines of school at the end of the day. The children try to direct, to deaden and to receive and interpret sounds without the blessings of the teacher, and, in so doing, may learn more of the scientific method than they ever get in their classes in "science".

Study of Sound

There is probably no aspect of science teaching that lends itself better to real experimentation than does the study of sound. Sounds can be produced at will with a minimum of equipment and in startling variety. Their interpretation should contribute more to the development of the scientific attitude than most of the standard activities dealing with interstellar space, or what happens to an electron. A thumb-nail outline for the study of sound would include activities in which sounds were reduced, augmented, directed, interrupted, received, interpreted, distorted, used, avoided, and more generally understood.

A new series of books seeking to develop air-mindedness in children provides us with an excellent example of the failure of technically-trained physical scientists to interpret correctly the biological significance of sound. Thus a book for elementary children tells us that bats guide their movements through treetops by sounds produced "by their wings". As may be seen by the insert in this number of NATURE MAGAZINE, which was printed before this book was released for publication, the true story of how bats use sounds to guide their movements is even more interesting. Most of their high-pitched cries cannot be heard by us, but bring to the bats' ears echoes to which the animals respond so quickly that they can avoid hitting twigs in flying through treetops in darkness. How much better it would be if sound were to be so studied that the children experiment to learn something of the hearing range of organisms with which they are familiar. See if any dog in the neighborhood can be made to respond to the sound produced when the bottom key on a piano keyboard is struck. See if a pet canary can be made to respond to any sound of the ordinary spoken voice of a man or woman. Go into the woods with friends on early spring days and try to locate by their high-pitched notes such birds as kinglets and brown creepers—in the chart on Page 84 "brown cricket" should read brown creeper. Or wait until the blackpoll warblers come and see how many of your friends are unable to hear them at all. Go into a garage and see how a mechanic makes use of his ability to hear when he tries to tune up a motor. Are deaf mechanics commonly found working on motors, and can you hear and interpret correctly all of the varying sounds that are significant to a motor expert?

Some Activities

Here are a few of the many school activities that young children may undertake, but which are for the most part ignored in standard "science" programs.

How may sounds be effectively muffled? What materials are useful in muffling sounds? How are sounds commonly muffled and how does muffling help? Under what circumstances is the muffling of sound important to the individual, economically or otherwise?

How may sounds be effectively magnified? What materials tend to magnify sounds, and under what conditions is sound magnification to be desired?

How does the pitch of sounds vary as the source of sound approaches the listener, or as it moves away? For example, does the pitch rise or fall as a train approaches? Of what importance would this knowledge be to a soldier who could hear a missile overhead?

How do sounds vary in the way in which they affect different members of a family? What sounds evidently cannot be heard by very old persons, and how are these shortcomings overcome?

How do sounds affect one's ability to concentrate on different problems? For example, can different columns of figures be added with equal speed and accuracy when radio or other sounds are to be heard, and when it is quiet? Is this equally true with all persons at all times?

Ears and Sound

Of the animals that have large movable ears, like those of mules, which ones live for the most part on plants and which live largely on animals? How could these ears be expected to modify the ability of their owners to hear well and thus to avoid capture by their enemies? Which ones have strong means of defense? What common animals have the ability to direct their ears without moving their (Continued on page 104)

Know Your Stars

Broaden your scope of understanding beyond our little world; reach out for information about the universe; it's interesting and not so very complicated.

The earth rushes through the solar system at an amazing speed. Every night we have new neighbors, some familiar friends, others, with a distant mysterious look, challenging identity.

Own a star finder and you are behind the scene of this year's heavenly displays. Have at your finger tips a mirror of the sky for every hour of darkness.

Handy Star Finder

(Size 8½ x 8½ inches)

An excellent and accurate device for amateur astronomers. Equipped with a sliding screen adjustable to any northern latitude. It gives the right ascension of the principal planets for the years 1941 to 1945; names of constellations with their principal stars; astronomical terms; distances of the planets from the sun.

A Real Value at Only 50c Each

(Quantity discounts to schools for classroom use)

NATURE MAGAZINE
1214 Sixteenth St., N. W.
Washington, D. C.

Enclosed is ..... for which mail me postpaid ..... HANDY STAR FINDERS.

Name .....

Street Address .....

City and State.....

Geology for Young People

Earth's Adventures. By Carroll Lane Fenton. New York. 1942. The John Day Company. 207 pages. Illustrated. $3.00.

Once again the man who seems to be able to make geology live better than any other scientist-writer we know of produces a book that will be welcomed. This time it is a story of geology for young people, tracing the story of our planet's adventures since it severed its connection with the sun three billion years ago. Not only does Dr. Fenton breathe life into the story of those things that make the scenic grandeur of this country outstanding, but he brings to the reader the fact that the same adventures of the past are going on right now for those who have the understanding to appreciate. Excellently illustrated by more than one hundred pictures, this popular geology text will add much to any outdoor trip. And while it is described as for young people, our feeling is that it will be equally interesting and valuable to most adults.

Our Poor Relations

Man's Poor Relations. By Earnest Hooton. New York. 1942. Doubleday, Doran and Company. 412 pages. Illustrated. $5.00.

In his preface to this informative and entertaining book, Dr. Hooton says that "the longer I study man, the more interested I become in apes and monkeys, because human physique, temperament, and behavior are rooted in the lower primates. Consequently, I think that the splendid research work of primatologists ought to be made available in a simplified form to educated persons." Not himself a primatalogist—in fact, he describes himself as "an enthusiastic amateur" in this field—but a noted anthropologist with rare ability as a writer, the author is able to present the story of knowledge of the primates free from the burden of factual material that might inhibit the specialist in attempting a popular work. Dr. Hooton's books and other writings are always welcome, refreshing in their humor and delightful reading. This book is no exception, and his introductory chapter, which bears the title "An Anthropologist Looks at the Primates—and then Looks Back at Himself", strikes the note that carries through this volume. He writes for the educated layman, meatily, wittily and valuably.

For your Nature bookshelves—

OUT OF DOORS IN SPRING
OUT OF DOORS IN SUMMER
OUT OF DOORS IN AUTUMN
OUT OF DOORS IN WINTER

By C. J. Hylander

Four books that help you have more fun out of doors in all the seasons. Fascinating things to watch in the world of flowers and birds, and suggestions to guide you on your walks. Generously illustrated. (Ages 8-12.) $1.50 each.

The Macmillan Company—N. Y.

Feed the Wild Song Birds with a 2 in 1 Hanging Feeder $2.00 postpaid
Made of Wood Stained Brown
Holds 2 qts. Feed, 1 lb. Suet Size 11"x11"
Wren House in Summer Feeder in Winter
Two Other Styles
All
Window $2.00 | 3 Feeders $5.00 | Tree $2.00
Postpaid
RODERICK PAYNE
"HONEY HOLLOW"
OXBOW BEND LANE EST. 1912 NEW CARLISLE, OHIO

AQUARIUMS
Over 20 different designs and 50 sizes
Tropical and Gold Fish
Over 200 varieties at reasonable prices.
CATALOGUE IN COLORS 10c.
Over 100 subjects illustrated in natural colors with 200 black and white illustrations. Send for this catalogue today. Only 10c.
Beldt's Aquarium, 2150 Crescent Avenue, St. Louis, Mo.

Burpee's Finest
VEGETABLES
Send for these five--Burpee's best Radish, Carrot, Lettuce, Beet, Tomato--all 5 10c-Pkts. of seeds postpaid for just 10c.
5 PKTS. 10¢
Burpee's Complete Vegetable Garden—15 Pkts.
Bush Beans (1 green, 1 wax), Tomato, Radishes (1 red, 1 white), Carrot, Swiss Chard, Sweet Corn, Cucumber, Lettuce, Onion, Parsley, Beet, Squash, Turnip (value $1.70) $1
SEED CATALOG FREE
All about the best flowers and vegetables. Have a garden, grow more food.
W. Atlee Burpee Co.
703 Burpee Building Philadelphia, Pa. (or) Clinton, Iowa
☐ Send 5 Pkts. Vegetable Seeds for 10c.
☐ Send Vegetable Garden, 15 Pkt. $1.
☐ Send Burpee's Seed Catalog FREE.
Enclosed is .....
Name.....
Address.....

NOVEMBER NOVA FADES AWAY

(Continued from page 99)

about 77 hundredths of the moon's diameter will be covered by the earth's shadow. In the eastern states the moon will enter the earth's shadow three minutes after midnight on the night of February 19-20, and will leave the shadow at 3:13 A.M. February 20, Eastern War Time.

Among the planets this month we will find Venus, Jupiter, and Saturn in the evening sky, and Mars and Mercury in the morning sky. Mercury will be at its greatest distance west of the sun on February 18. It will be too close to the sun to be seen in the early part of February, but should be picked up low in the southeast shortly before sunrise for a week or so before and after February 18. It will be about equal to Vega in brightness at that time.

Venus is improving its position in the western evening sky. Its distance from the sun is gradually increasing and by the middle of the month it will set about an hour and a half after the sun. It is more than a magnitude brighter than Jupiter, which is its nearest rival in brilliancy, and its brightness is steadily increasing.

Jupiter is now in Gemini, a few degrees to the southwest of Pollux, and very close to the third magnitude star, Delta Geminorum. It surpasses even Sirius in brightness, and in color is a deep yellow.

Saturn is in Taurus, a little to the northwest of Aldebaran, close to the Hyades, and between them and the Pleiades. It is equal to Capella in brightness, and its pale yellow color contrasts strongly with the deep red of Aldebaran. On February 25 Saturn will be in quadrature with the sun and due south at sunset.

Mars is low in the southeast in Sagittarius before sunrise and is still no brighter than a star of second magnitude, but is slowly increasing in brightness. It can be readily recognized by its reddish color.

RUKUPI, RARE RODENT

(Continued from page 101)

Until 1904 the type specimen was the only one known. In that year a live female and her young one were received by E. A. Goeldi of Para, Brazil, from the upper Rio Purus. The species was next reported in 1919 from the upper Amazon, and in 1921 from Gualea, Ecuador, and from La Candela, Colombia. These specimens gave rise to three new specific names, and extended the known range of the animal.

In 1922 and 1923 Edmund Heller of the Field Museum brought back from the region of the original locality a series of twenty-four specimens. This material, which exhibited considerable variation, enabled Sanborn to make a careful study of the history of this remarkable animal. His conclusion is that all the varietal names proposed by recent authors refer to the original species, which he gives as ranging in the Andes mountains from central Colombia through Ecuador to central Peru and east to the Rio Purus region of Brazil.

THE SCHOOL PAGE

(Continued from page 102)

heads otherwise?

Since it takes sound about five seconds to travel a mile under ordinary climatic conditions, it is relatively simple to form some judgment as to the distance between yourself and a train which you can see whistle and later hear. It is more important that persons in military or naval service should have good judgment in matters of this sort to the end that they may make rational interpretation of firing and other explosions that may be witnessed and heard. Is it too much to ask that schools provide children with some background for this training?

Echoes that represent round-trip journeys of sound waves from a sender to a reflector and back have significance in Nature and elsewhere. What significance can you and your pupils read in the sounds that come to you as a car goes past a row of parked cars at night or as a train dashes through the night? Can you approach the understanding of sounds that is developed by a blind person who can read into the echoes of snapped fingers or a tapping cane much of what the surroundings may be?

So dependent are we on sounds for gaining information, for safety and for entertainment that it is important that we preserve and cultivate whatever ability we may have in this direction. The music teacher attempts to produce some changes, but these are tremendously limited in their significance. For the most part, the most thrilling of experiences with sound are left almost entirely to the ingenuity of the child. How much better it would be if child and teacher could work together to improve knowledge.

VICTORY GARDENERS MAKE HISTORY

(Continued from page 95)

to make them. At least a fourth of all the food we produce is pledged for the armed forces and for lend-lease shipments abroad. An 8,000,000-man army eats a lot. A man in uniform is said to need 306 pounds of meat a year, contrasted with 172 pounds for a civilian. We at home will eat less meat and make up the difference with other foods some of which we can produce ourselves. Instead of having forty cans of food a year, we will have to do with less or can our own, so that our soldiers can have eighty cans each. In addition, four times as many vegetables will be dehydrated for shipment abroad and for the Army and Navy—a total of 400,000,000 pounds. Transportation systems are already so overworked that every effort will be made to eliminate the long-distance shipping of vegetables and other food products which can be produced near at hand. The answer is clear. Every American family will have to grow as much of its own food as it can possibly produce.

This year the Office of War Information is getting behind the Victory Garden program, and so is the Office of Civilian Defense. You will probably have a garden leader in your block or neighborhood who will give you the latest information on how to garden, and with less fertilizer and fewer insecticides. And the free literature that will be available both from Washington and your county agent, garden center, or state agricultural college will be greater than ever before.

Yes, this year it will be a different story. Few Americans dreamed of the infamy that made Pearl Harbor possible. Fewer still dreamed that food shortages would follow so soon. "In war-time famine slips up on you before you know it," Governor Prentice Cooper of Tennessee told our Committee in Washington in January, 1942, as he explained the plan that is making his state self-sufficient. Few of us took him seriously then. This year such advice will be heeded.

American gardeners are already making plans to plant the greatest food garden the world has ever seen—a garden that will stretch from coast to coast, and from the Gulf to the Great Lakes. And there will be flowers too, perhaps not so many, but they will be there along with the grass and the trees. And that will be the gardeners' answer to Shicklgruber and Hirohito!

OGRES OF THE PRAIRIE

(Continued from page 92)

parents approach with food. Watching from my hiding-tent I saw them stand up, yawn and stretch their wings several times.

With the exception of their alarm or scolding calls, the voices of the shrikes are somewhat musical. I have never heard a long sustained song but sometimes pleasant little notes and phrases can be traced to one of these birds hidden in a dense bush. Anger and excitement are expressed by a rather prolonged "chaaa-chaaa-chaaa", and often these harsh cries are the first indication of the presence of the birds.

Shrikes are exemplary and devoted parents but very destructive during the early summer, so it is just as well they are not more numerous. However useful they may be at other times, they undoubtedly do a great deal of damage during the nesting season and for a month at least their food consists largely of the young of small insectivorous and seed-eating birds. The young birds stay with their parents for some time after leaving the nest and it is a pretty sight to watch family parties passing from thicket to thicket in the late summer.

It is worthy of note that the shrikes are among the very few small birds whose instincts have been used by man for his own purposes. In the days when falconry flourished, hawk-catchers used to tether them to their hiding-places to warn when the quarry was approaching. The sharp eyes of the shrikes were able to discern the birds of prey before they were visible to human eyes, and the trappers were able to adjust their nets or snares and seek cover before the falcons were near enough to be alarmed. This custom, of course, is now a thing of the past and, I believe, persists only in one place in Holland at the present time.

Words of Wisdom

Because we could not hope to state it better, if as well, we quote the following by W. Scott Lewis, writing in his *Mineral Bulletin*. Under the title of "Unlimited Shooting?" he says:

"The suggestion has recently been made that all game laws should be suspended because of the meat shortage so anyone could kill all the deer, ducks, doves and other creatures he could, thus leaving more food available for our soldiers.

"This suggestion is so idiotic, short-sighted and hysterical that we would not consider it worthy of notice if we did not know that idiotic suggestions have a great appeal for a large number of our citizens. It is certainly unfortunate that so few people can see six inches in front of their noses! How often we find that the preservation of our natural resources is considered of no importance as compared with the chance for selfish pleasure or temporary gain. When we have upheld the right of future generations to enjoy the same beauties of Nature that delight us, we have been met with the retort, 'I am not going to worry about future generations, they never did anything for me.'

"It does not seem to enter some people's heads that we are the custodians of an enormous natural treasure. This treasure does not belong to us in any true sense of the word. It belongs to the Creator of all life, although man has a large degree of management over it. If man exercises that management properly, this treasure can be enjoyed by generation after generation. Unfortunately selfishness has often led to losses that can never be restored, and even today some of our most interesting birds and animals are threatened with complete extinction.

"Nature lovers should be constantly on the alert, especially in times like these when there is an increasing tendency to consider life of little importance and to think of such virtues as kindness and gentleness as almost undesirable qualities. This war is only temporary and we trust it will be followed by a permanent peace. The human race will presumably go on for ages, but the better world of tomorrow will be sadly lacking if we permit the destruction of our wild life today."

Johnsonia A Year Old

With the publication of a 40-page issue—the sixth—*Johnsonia* rounds out its first year. Published by the Department of Mollusks, Museum of Comparative Zoology, Harvard University, this publication has filled and will, we trust, continue to fill a demand created by those interested in the study and collection of shells. The latest issue covers the Genus *Conus* of the western Atlantic and is the work of William J. Clench of the Museum staff. Excellent illustrations supplement the descriptive text.

Vaughan's Victory Garden Guide IN THE MOST BEAUTIFUL SEED CATALOG

250 FLOWERS IN COLOR FREE!

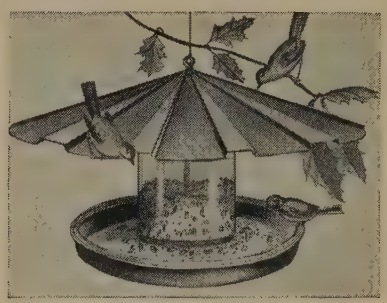
IN OUR "GARDENING ILLUSTRATED," 1943, a Victory Garden Guide shows how to plan your vegetable plot for all-season yield and maximum nutrition. Tender vitamin-rich vegetables never found in markets. Also our 2206 flowers, bulbs and plants. 128 pages, 52 in natural color. Money-saving special offers.

Special for 1943. Oak Leaf Lettuce, most popular "green leafy vegetable." Forty times richer in vitamin A than head lettuce, thrives, keeps tender all summer. Salad addicts rave about it. Pkt. 10c.

VAUGHAN'S SEED STORE, Dept. 52
10 W. Randolph St., Chicago, or 47 Barclay St., N.Y.C.

10 BLUE SPRUCE TREES $1 POSTPAID

SPECIAL OFFER
Colorado Blue Spruce, 4 yr., transplanted 3 to 6 in. tall—only $1 postpaid. 22 only $2 postpaid! Another Bargain: 50 Evergreens $3, postpaid; all 4 and 5 year transplanted, 4" to 12" tall. Ten each Douglas Fir, White Spruce, Red Pine, Norway Spruce, Mugho Pine, all 50 for $3. (West of Mississippi River add 15c.) Free illustrated price list of small evergreen trees.
All Trees Guaranteed to Live.
WESTERN MAINE FOREST NURSERY
Box NM-23 Fryeburg, Maine



Birds Feed and Frolic at the *Country Life*
WILD BIRD FEEDER

Give friendly birds a helping hand. Enjoy their company the whole year 'round. The *Country Life* WILD BIRD FEEDER, sturdy metal construction, protects grain from weather and squirrels. Safe, comfortable perch. New "Kleer-Vu" reservoir lets grain t-r-i-c-k-l-e down as needed.

ORDER BY MAIL
Country Life WILD BIRD FEEDER, complete with sample Country Life Bird Food, only $2.50 postpaid. GIFT SPECIAL—*two* Feeders, with sample food, only $4.75. Order now—so birds will stay all winter.

BRECK'S *Seedsmen Since 1818*
713 Breck Building Boston, Mass.

Burpee's *Giant* ZINNIAS

4 Best Colors 4 Packets 10¢
Scarlet, Lavender, Yellow and *Rose*. Giant Dahlia-Flowered blooms 5 in. across and 2 in. thick. Easy to grow. Sturdy, well-branched, 3-ft. plants. All 4 15c-Pkts. of seeds, 1 of each color, *postpaid for just 10c!*

W. ATLEE BURPEE CO., 702 Burpee Bldg., Philadelphia, Pa. —*or*— Clinton, Iowa
☐ Enclosed is 10c. Send 4 Packets Giant Zinnias.
Name.....
St. or R. D......
P. O. & State.....
☐ Send Burpee Seed Catalog, all about best Vegetables and Flowers, planting information. Leading American Seed Catalog.

Burpee's Seed Catalog FREE

(Continued from page 80)

Morse frankly in one analysis as "a monster of single-minded egoism," unconscious of the human hardship of his attitude toward those close to him yet never "consciously cold or cruel." It is a marvel, which she later explains, that Morse was loved and admired as he was.

Rutherford Platt's account of the green world of trees and flowers is as vividly interesting in its descriptions of the habits of trees and flowers as Mrs. Wayman's is in her characterizations of Morse's peculiarities. Mr. Platt excites much the same emotion of marveling when he writes of trees as the "world's greatest waterworks," or of leaves as food factories, as Mrs. Wayman does when she describes Morse's ability to recognize at a glance the unfamiliar hieroglyphs of ancient Japanese potters. And as Mrs. Wayman provides her readers a work of historical value in its account of the America of self-helping boys who achieved eminence, and the world of science when Agassiz and Darwin were at work, so also Mr. Platt contributes to his readers' knowledge of natural history—contributes one of the most effectively informative works on trees and flowers that I have ever read, a book that I surmise may even be informative to many experts. Its 110 drawings and 135 photographs—including 27 in color—are even without the text a contribution to knowledge to be valued highly, and a revelation of beauty.

Yet when Rutherford Platt, an American business man, was at the age of 35 he had never, he testifies, "had the slightest inkling" of the marvels of trees. A Yale graduate doubting that he could call by name any native wild tree but the elm, he was aroused to his interest in the green world only by the chance observation of a botanist from the Brooklyn Botanic Garden with whom he was walking.

"As a business man who has had the surprise of his life," he now writes, "I can assert that you will enjoy looking twice at trees and flowers because they are exciting, refreshing, reassuring."

This is the reminder of sublime possibilities in human living that is for me the virtue of *This Green World* and its author's experience. "The point," as Rutherford Platt himself writes, "is that this natural world is thrilling in the way it works. I am not thinking so much of the poetry and melody, or of reflecting on a tree or flower as you might on a masterpiece in an art gallery. I am thinking of the mental stimulation, of the value of information, of accuracy of expression, of the feeling of freedom, and sheer entertainment—all around us and available at little expense and bother for anyone who will only take a look."

This testimony of Rutherford Platt is curiously akin to Mrs. Wayman's explanation of the marvel of the sublimity of Edward Sylvester Morse:

"Somehow, as an uneducated boy on the long sweep of the Maine beaches or in the green Maine woods, Edward Morse had found in Nature a radiance that shone through his personality with the glow of a kindled taper. He could set sparks glowing in every person with whom he came in contact."

There are indeed inescapable intimations in the lives of both Rutherford Platt and Edward Morse that a consciousness of the world of living things which we call Nature is an influence for sublimity which we may all know. This, of course, is not exactly a new revelation; Longfellow promised us only reminders.

Edward Sylvester Morse: A Biography. By Dorothy G. Wayman. Cambridge, Mass. Harvard University Press, 1942. 457 pp., with 12 photographs, 2 drawings by Morse, foreword by Thomas Barbour, appendix on Morse's Japanese honors, and index. $4.50. (An excellent job of book making.)

This Green World. By Rutherford Platt, New York. Dodd, Mead & Company. 1942. 222 pp., with 135 photographs—27 in color—and 110 drawings by the author, index and supplements on: How To Be a Tree Detective in Winter, Pictorial Key to Nature Evergreens, How To Be a Tree Detective in Summer, and What To Read. $3.75.

Nazis and Forests

Nazis in the Woodpile. By Egon Glesinger. New York. 1942. Bobbs-Merrill Company. 262 pages. $2.00.

In the October, 1942, issue of NATURE MAGAZINE, Dr. Egon Glesinger told, in his article "Rediscovered Wood", of the tremendous present and future uses of wood. He mentioned, in passing, the developments with wood that have taken place in Germany. In this book, however, the whole story of Nazi policies in the field of wood chemistry and utilization is set forth in an exciting and revealing manner. It is a story of the German plan to acquire forest holdings throughout Europe in at least a semi-legal fashion so that control over them would still rest in German hands in the event of a negotiated peace, or, even, defeat. This policy is pursued in view of Nazi chemical developments that have turned wood to myriad purposes in the economy of the Reich at war, and have enabled the Nazis to fill many gaps in that economy. This book is a story of intrigue and international politics, and is significant in reckoning with the staying powers of the present German system. Finally, it is fascinating reading.

The Display of Birds

Bird Display. By E. A. Armstrong. New York. 1942. The Macmillan Company. 381 pages. Illustrated. $3.50.

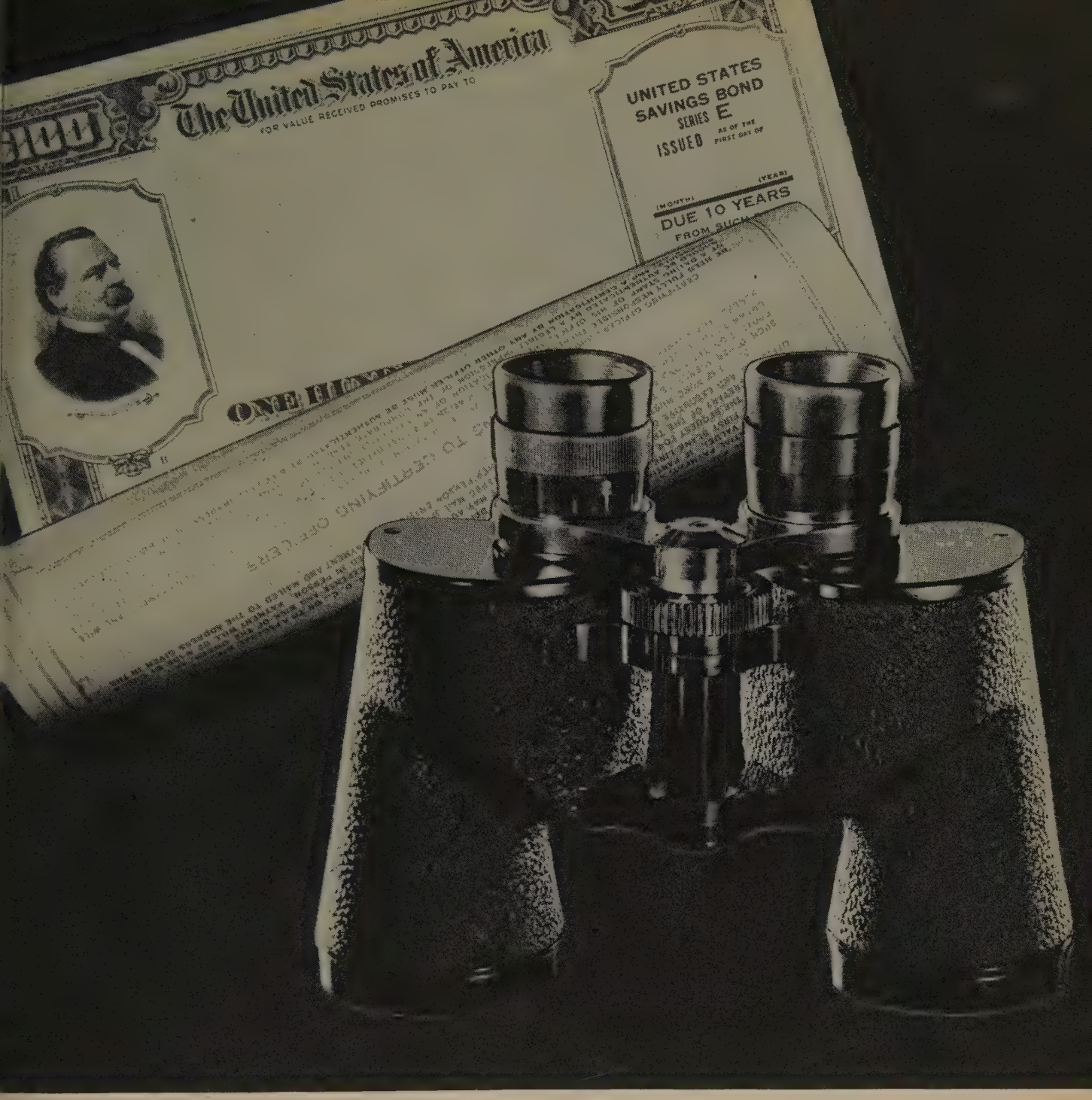
This is a significant book in the field of bird study and will be of special interest to ornithologists. The author has long studied this subject of display among birds, seeking therein a clue to bird psychology. He has brought together a wide variety of recorded information, supplemented by his own notes, in an effort to arrive at a body of knowledge that will warrant some general conclusions. The book was printed in England at the University Press, Cambridge, and, incidentally, reflects the impact of war in the paper upon which the text is printed. The forty splendid pictures, however, are given the best reproduction.

Parks and Recreation

Park and Recreation Progress. Washington, D. C. 1942. National Conference on State Parks. 48 pages. Illustrated. $1.00.

This large-size bulletin, published as a public service by the National Conference of State Parks, brings us up to date on what has been accomplished in the State Park movement and in its recreational implications. It presents the story concisely and State by State. It is a valuable record of an important phase of our life in a free America. It should renew everyone's determination to keep this a free America.

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.



Buy a Bond . . . to Speed Victory Today . . . to Pay for a Binocular Later

If you're one of the thousands of outdoor lovers who have always wanted a Bausch & Lomb Binocular —but have hesitated to spend that much money all in one piece—here's a chance to assure yourself that instrument, and to help your country at the same time. *Buy a bond* out of today's income. It will be money for you in the world's strongest bank—money for you to use when a finer Bausch & Lomb Binocular than you've ever seen will be available.

Today Bausch & Lomb is producing more binoculars . . . more Ray-Ban sun glasses . . . range finders . . . height finders . . . many specialized instruments of war, science and industry . . . than ever before. Under stress of war production we're learning to do things better, faster, cheaper. The benefit will be yours—after the War.

BAUSCH & LOMB
OPTICAL CO. EST. 1853

AMERICAN SCIENTIFIC INSTITUTION PRODUCING OPTICAL GLASS AND INSTRUMENTS FOR MILITARY USE, EDUCATION, RESEARCH, INDUSTRY AND EYESIGHT CORRECTION

BEACHCOMBER'S BONANZA

(Continued from page 72)

"When hungry—the whale opens his mouth and emits a fragrant odor like amber; and other fishes, attracted and delighted thereby, swim into its mouth and down its throat. On some occasions, however, the whale uses this pleasant breath to save and protect little fish. . . . When a very wicked and venomous kind of sea-serpent glides through the dusky waves by night, all tiny fishes take refuge behind the whale, who then repels the . . . newcomer by the sweetness of his own effusion."

Herman Melville in his famous "Moby Dick" wrote:

"I say, that the motion of a sperm whale's flukes above water dispenses a perfume, as when a musk-scented lady rustles her dress in a warm parlor."

Before the experts decided that ambergris is a sort of whalian gall stone, various theories as to its origin had its ardent supporters: (1) Ambergris was a substance that sprang from the bottom of the sea, like naphtha or bitumen from the earth. (2) It was congealed wax or gum dropped from trees near the sea shore. (3) It was a marine fungus torn up from the ocean bottom by violent tempests. (4) It was composed of the excrement of birds washed off rocks, or of honeycombs which had fallen into the ocean from rocks where bees had built their nests.

The general acceptance of the present-day belief that ambergris is a morbid secretion formed in the alimentary canal of the sperm whale, both male and female, was brought about by a communication to the Royal Society by Dr. Swediaur.

The exact nature of the stuff has never been defined. One theory is that it is formed inside the whale because of his unusual diet. *Physeter catodon* eats a ton of squids every day, and these are said to have a musky odor. Some think that the parrot-like beaks of the cuttlefish cause irritation in the whale's intestines, and ambergris is a secretion thrown by Nature around these indigestible beaks. It is true that squid beaks are usually found in ambergris. C. B. Hawes points out, however, that all whales eat squids and only a few seem to have ambergris trouble; so this theory belongs in the same category as the idea that eating grape seeds causes appendicitis. Black amber, by the way, is thought to take its color from the sepia or ink of the squid.

In addition to its use in perfumery, ambergris is still used in the Orient for spicing wines. It was used in ancient times as a medicine, as an incense, and in cosmetics. Pilgrims to Mecca took ambergris as an offering, and the Mohammedans believed it was an infallible aphrodisiac. Mention is made of the substance in the *Arabian Nights*, and an English text published in 1691 tells of its remarkable healing powers. However, none of the claims made for the medicinal value of ambergris have stood up under modern medical research.

The chance of your finding a chunk of ambergris on the beach is about one in a million. However, if you should stumble over a piece some time, and decide to make a tincture of ambergris yourself, here are the instructions as given by Deite:

"Ten grammes of the grey variety of ambergris is cut into thin slices and then pulverized with an equal quantity of sugar of milk, the whole being then dissolved in a litre of spirits of wine. This alcoholic solution of ambergris passes through a process of ageing and should only be used after twelve months' storage when it has considerably improved from a perfumery standpoint."

Most colorful and ferocious of all whales, largest and most widely distributed of all the toothed whales, the sperm has been getting scarcer year after year. "Moby Dick" cannot withstand modern factory ships, harpoons shot from cannons, and other machine-age inventions. Perhaps while the whalers are out harpooning each other, the sperm whale—Nature's own ambergris manufacturer—will make a bit of a come-back. Here is hoping!

CASCARA GOES TO WAR

(Continued from page 75)

Whether they are cut or left standing has a marked influence on future crops. So does natural seeding in logged-off lands. About 150,000 acres of timber are cut every year in Oregon and Washington. Much of this land could carry good stands of cascara. In the Grays Harbor region of northwestern Washington such deforested areas have become an important source of the bark. Birds scatter the black berries. And, while the germination is only medium or low, the tree is an early and prolific seeder. Three-year-old seedlings may produce berries. This natural seeding of logged-off lands offers one of the greatest hopes of maintaining a steady yield throughout the years. On the other side of the ledger a great deal of valley land has been cleared and converted to farm use that formerly carried considerable quantities of cascara.

Trees of less than five inches diameter should be left standing, both to give an opportunity for natural seeding and to allow the crop to mature. A three-inch tree, for instance, will yield only about five pounds of dry bark, while a six-incher may peel more than three times that much. A seventeen-inch veteran may have as much as 175 pounds.

Alone on foot with a blanket roll, in pairs with a pack horse, and in family groups in semi-permanent camps, the hunters of the big trees carry on. It is a far cry from the rain forests of the Pacific Coast to the battlefields of Europe, but the cascara peelers in our deep timber are helping lick the Axis halfway around the world.

Important Measure

Under the limitations of the Clarke-McNary Law the total Federal funds that might be appropriated for forest fire protection—on a basis of matching appropriations by the States—was $2,500,000. Conservationists are now solidly behind an amendment to the Law that would permit an appropriation up to $9,000,000. Such amount, also, would have to be made available in the aggregate by the States. This is an important proposal in days when our forest resources are vital to our future, and when the problems of fire control are complicated by war conditions. This is a proposal that should be enacted into law.

National Park Stamps

An attractive little booklet of stamps for each one of twenty-six National Parks is now available for ten cents from the Superintendent of Documents, Washington, D. C. These are not to be confused with the issue of commemorative postage stamps a few years ago. The stamps are illustrated with a characteristic animal of each park, the originals having been done by Walter A. Weber. We understand that these are also to be bound up in sets of stamps for the same park, so it will be possible to get the assortment, or, if you have a favorite park, stamps for that park alone.

NOW!

A New Series of Four Books on

Conservation

for Grade School Children, titled

"My Land and Your Land"

Written by Educators
Approved by Conservationists
Colorfully Illustrated

"WOULD YOU LIKE TO HAVE LIVED WHEN?"

(Book No. 1)

Is a graphic, interesting tale of what our forefathers found here when our country was young. Virgin forests and soil, pure, clear lakes and rivers, wildlife of all species in abundance greeted the early settlers. It paints the picture of our expanding country, of the movement westward over the mountains of New York, Pennsylvania and the Virginias into the valleys of the Ohio and the Mississippi by ox-carts, flat boats and covered wagon. Cutting down forests to make farm land, plowing up the prairie for more farm land, killing off much of nature's store house of wildlife made problems for the generations of people who followed these pioneers in the frontiers.

"RAINDROPS AND MUDDY RIVERS"

(Book No. 2)

In it the reader is shown in simple words, pictures and example how dependent all life is on pure, clean water. The interrelationship of water, soil and life is a story of absorbing interest. Drought, erosion and floods mean either too much or too little water. The wise control and use of our streams, lakes and other waters are pointed out by illustrations which print in the mind the morals to be learned.

"PLANTS AND ANIMALS LIVE TOGETHER"

(Book No. 3)

Plants are the only natural food factories. All animal life, including man, is depending upon them in one form or another. This intricate relationship is beautifully told and brings into the mind the need for careful management and use of these bountiful warehouses of nature. The harmful insects, plants and animals are brought to the attention of the reader and he is able to weigh their values in his own existence.

"NATURE'S BANK— THE SOIL"

(Book No. 4)

In this book the riches of the soil are brought into bold relief. Everything that lives and breathes comes from the soil, either directly or by several steps. These steps are delightfully told and become fixtures in the reader's mind. Nature's Bank is the richest and the oldest bank in the world. How to extract these riches without robbing the bank is the theme of this book.

These Books Make Excellent Gifts For Youngsters.

American Nature Association
1214-16th Street, N.W.
Washington, D. C.

Kindly send ..... sets of "MY LAND AND YOUR LAND" Conservation Books at $1.75 per set.

NAME .....

ADDRESS .....

CITY .....

Check ☐ Money Order ☐ C.O.D. ☐

BUTTON, BUTTON, WHAT'S THE BIRD?

(Continued from page 97)

use of the collections has become an integral part of the school program, "bird walks" have been scheduled for regular periods in the school curriculum. These walks give the teacher an opportunity to know her students as individuals. She watches the natural behavior of "that little Joe Smith" who shows off in the classroom to cover up an inferiority complex, or hears the freckle-faced class rough neck label the expedition "sissified" because he is unable to locate many birds, or notices, perhaps for the first time, that the shy little girl who hesitates in her identification of a bird does so because she is color blind.

Undoubtedly, many of our educators would frown on wasting time on such "unimportant" work. They should have an opportunity to watch a group of students at work during a field trip, or in the classroom checking identifications. It is then that one experiences the pleasure of looking into the face of a youngster who has, for the first time, identified a bird that in the past was a total stranger to him. It may be that for the first time this youngster has discovered something through independent thought. With that discovery the doors begin to open into the really wonderful world in which he lives, a world of simple things that so few of us are capable of enjoying. And what more is education!

Alice Eastwood Honored

Probably the world's greatest woman botanist, Miss Alice Eastwood was recently honored by scientists at a ceremony in observance of her completion of fifty years as curator of the Department of Botany of the California Academy of Sciences. A native of Toronto, Canada, the 83-year-old scientist joined the Academy staff in 1890, and two years later became joint curator of the Department. Before that she had taught in the Denver, Colorado, high schools, where her botanical genius first became known. During the San Francisco earthquake and fire Miss Eastwood, ignoring personal safety, helped save priceless specimens and collections. During the reconstruction of the Academy she spent the time in the field, both in this country and abroad.

CLASSIFIED

FILMS DEVELOPED

READY-TO-FRAME 6x4 Enlargements, 5c! Hand colored 20c—from your negative. 16 reprints your negative, 25c. Kodak roll developed with 16 guaranteed deckled-edge Velox prints 25c! 36 exposure 35mm roll developed, vaporated, enlarged to 3x4, $1.00! 3x4 reprints, 3c each. Immediate Service! Free mailers! **AMERICAN STUDIOS, Dept. 506, LaCrosse, Wis.**

HORTICULTURAL

NATIVE Flowering Plants. Catalogue. **Three Laurels, Marshall, No. Car.**

INDIAN CURIOS

25 **Genuine Indian** arrowheads. $1.00. Catalog. **GEO. HOLDER, Glenwood, Ark.**

PETS

NEW HOBBY CATALOGUE for stamp, 50 pages, illustrated. Chameleon 25c, armadillo $5.00, golden hamsters, $4.25 pair. **Quivira Specialties, Winfield, Kansas.**

FLYING SQUIRRELS—Raise them for pets, profit, pleasure. Mated pair and booklet $3.00, safe delivery anywhere guaranteed. **Wildwoods Fur Farm, Woodville, Texas.**

PHOTOGRAPHY

"HOW TO MAKE GOOD PICTURES". Twenty-third edition now available. Up to date in every respect with details of Kodachrome and Infra-Red photography; new chapters include Stunt Photography, Flower Photography, Night Photography, Indoor Portraiture, Composition and many more new features. At 50c this book still remains at the head of our "must" list. **NATURE BOOK DISTRIBUTORS, 1214 16th Street, Washington, D. C.**

SCIENTIFIC

NEW and used field glasses, bought, sold, exchanged. **J. Alden Loring, Owego, New York.**

SEA SHELLS

SHELLS FOR SALE Land and Marine; Cape Cod Special 12 for $1.00 in box; Lists on request. **MRS. F. K. HADLEY, Box 33, West Newton, Mass.**

TEACHERS, WE PLACE YOU In The Better Positions
Opportunity knocks now as never before
FREE ENROLLMENT
Write For Enrollment Material
ROCKY MT. TEACHERS' AGENCY
410 U.S. NAT. BANK BLDG. DENVER, COLO.
Largest, Most Widely Patronized Teachers' Agency in the West

BEHIND YOUR CONSCIOUS MIND

Do you use just your thinking mind? If you do, you are missing 90 per cent of your possibilities. Those occasional hunches are the urges of a vast sleeping force in your inner mind. Learn to develop and direct it. Push obstacles aside and master life with an energy you have overlooked. Send for FREE SEALED BOOK. It tells how to obtain these teachings. Address: Scribe G. G. M.

The ROSICRUCIANS
SAN JOSE [AMORC] CALIFORNIA

Under the Microscope

By JULIAN D. CORRINGTON

EPITHELIUM

HISTOLOGY, or microscopic anatomy, is one of the few sciences that deals wholly with microscopic objects, and one that takes high rank in interest and informational value. Smears of cells, thin films of membranes, and stained sections of organs are examined to determine the components of all parts of the body, both animal and plant. Animal histologists recognize five tissues, some with subdivisions, as making up all organs—epithelial, connective, muscular, nervous, and vascular. The last, dealing with the blood, was considered in this Department in the issue of April, 1940.

First among these tissue groups in every respect is epithelium. In the blastula and gastrula stages of the embryo, the entire animal consists of epithelium alone, hence this tissue is parent to all others that appear later. In the adult, epithelium lines all of the surfaces of the body, inside and out, and is thus the first to encounter the environment. Food that we eat must, after digestion, pass through the epithelial lining of the intestine to be absorbed into the blood; oxygen in the air we breathe must diffuse through the epithelium paving the lungs; and both of these, to gain the blood stream, must pass through the exceedingly thin epithelial wall of capillary vessels.

An epithelium is defined as a sheet or layer of similar cells with one free surface, a unique distinction. The several kinds are classified according to two criteria: shape and arrangement of the cells. Epithelia are either *simple*, consisting of a single layer, or *stratified*, with more than one, frequently many layers. In shape, these cells are either *squamous* (flat), *cuboidal* (squarish), or *columnar* (tall and narrow). Combining these two descriptions gives terms useful in designating types, as in speaking of a simple cuboidal epithelium or a stratified squamous variety.

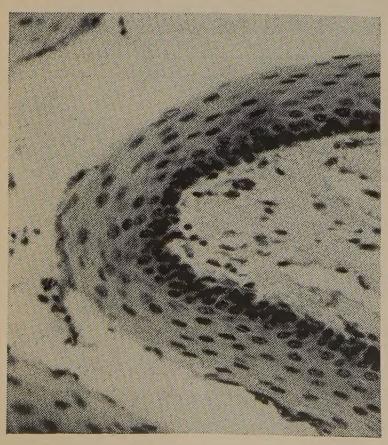
Occurrence of such types is on a functional basis, and if one studies the physiological requirements of any special organ, it is not difficult to forecast the kind of epithelium that will be found lining its surface or cavity. For example, the skin, though it has numerous subsidiary functions, is primarily protective and must be thick, hence here we find a stratified squamous, as is true also of the esophagus (illustrated). All thick epithelia are of this type, in which only the cells of the surface layers are actually squamous in shape, deeper cells being cuboidal or even columnar. The lung and blood vessels must have the thinnest possible lining, to permit diffusion of gases, and, as we might guess, simple squamous sheets cover their internal surfaces. In tubules of the kidney, the pavement function has also to contend with excretion, and a simple cuboidal epithelium best cares for the two needs at once. In the intestine, where both secretion and absorption are requisite, a simple columnar type interposes only one layer of cells to impede absorption, yet provides sufficient space for the production of secretion.

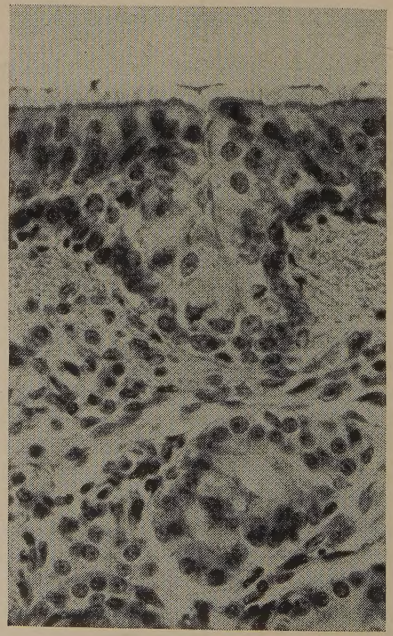
Speaking of secretion, this important manufacturing job is mainly the work of glands, which are epithelial sacs. In some cases, single cells give off secretion (unicellular glands), but mostly the task is relegated to specialized groups of cells that push away from the main surface and, freed from other duties, devote their entire energy to the elaboration of their product. In development, the epithelial sheet is folded down into the underlying connective tissue, a process termed inpocketing or invagination. A good example of a simple tubular gland that arises from the skin by such a downsinking is a sweat gland. If the bottom portion expands into a sac or ball shape, increasing the secreting area, as in mucous glands of frogs, the type is called simple alveolar. Frequently the downgrowing epithelial bud forks repeatedly, making a compound gland, either tubular, as the kidney, or alveolar, as the pancreas.

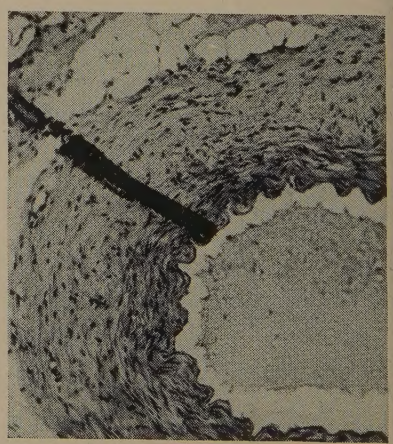
In many of the larger glands, the slender original connection between the deep-seated secreting portion and the surface from which these cells deployed remains as the duct, such as the bile duct of the liver. In other cases the duct becomes obliterated and the gland then pours its secretion directly into the blood stream. These are the endocrine or ductless glands, producing internal secretions, as the thyroid or pituitary.

Where circumstances require movement at the sur-

Below, stratified squamous epithelium, esophagus, cat, 270X. Right, pseudostratified ciliated columnar epithelium, trachea, cat, 350X. Part of a duct of a mucous gland appears at top and a portion of the alveoli at bottom, in the connective tissue. Below, artery, cat, 100X. The endothelium is the single inner line, with minute bulging black nuclei.







face, epithelial cells may be provided with cilia. In the trachea (illustrated) these beat so as to drive a film of mucous outward, this material meanwhile collecting on its viscous surface such foreign objects as soot, dust, and bacteria, thus keeping much of them out of the lungs. This particular epithelium appears to be stratified because these very tall and thin cells are so closely packed that the nuclei are forced to lie at different levels; actually, however, each cell reaches both upper and lower surfaces of the layer, even though by only a slender process in some instances. The full name for this specialized form is then pseudostratified ciliated columnar epithelium.

Another peculiar type occurs in the wall of the urinary bladder, where the cells are thought to slip past each other to permit a high degree of distention in this organ. In the contracted bladder the cells are tall, pear-shaped or club-shaped, and in numerous layers; in the expanded condition the cells are flattened and may be reduced to as few as two layers. This epithelium is called transitional.

Special terms have been introduced from time to time to describe particular epithelia. The simple squamous variety that lines the body cavity and covers all of the membranes and organs of the viscera is now known as mesothelium, while the similar type found lining the interior surfaces of blood and lymphatic vessels is designated endothelium.

Sections by any method of preparation are satisfactory for demonstrating epithelial tissues, the simple hand microtome being adequate. Where practicable, sections should be cut ten microns thick. Iron hematoxylin and many other stains are excellent, but no better combination than the good old routine Delafield's hematoxylin and eosin can be desired for all ordinary purposes.

BIOLOGICAL LABORATORY MANUALS

III. Botany (concluded)

Many of the larger college departments of botany have developed their own laboratory manuals for the beginning course. Probably the majority of these remain in the mimeographed stage, intended for home consumption only; a few have been published as printed and bound volumes, six of which were examined in our last installment; and some have compromised—which brings us to the group for present consideration. The three here discussed are all of the *work-book* type, using paper of standard notebook size, punched for various styles of metal binders. The first two are supplied in a printed, flexible, pressboard cover, the last as loose sheets in an envelope.

As an example of a conservative member of this family of manuals, we have selected *Laboratory Outline for General Botany*, by Professor Henry F. A. Meier, New York State College of Forestry, Syracuse University. The organization and treatment are along general lines of older style manuals, yet good use is made of the advantages of the work-book type. For the first semester, topics include the plant as a whole, with numerous illustrative forms, laboratory and field studies of leaves and trees, the microscope, cells, plastids, mitosis, tissues, plant parts, seeds and seedlings. The second half is a comprehensive study of plant groups. Physiological experiments are not stressed since in the department for which this book is primarily designed, the first course is followed by a required one in plant physiology.

In the 47 exercises, directions to the student are specific; he is quizzed, and writes answers or makes indicated drawings directly in blank spaces provided; only in one or two instances are there any prepared or semi-completed drawings. The result is a manual with everything provided in compact form; no additional note or drawing paper required; all information assembled and readily available for review. This manual has had many years successful use in its various earlier forms; it is very well thought out, compact, and ably written. Pp. 133. Lithoprinted, Edwards Bros., Inc., Ann Arbor, Mich., 1941. Obtainable from Syracuse University Book Store, 303 University Place, Syracuse, N. Y. $2.25.

Originally a collaborator with Dr. Meier in earlier editions of the preceding, Dr. Paul J. Sedgwick has now developed his own ideas in a two-volume manual, *Laboratory Outline for General Botany*, designed for the liberal arts course in botany at Syracuse. Long known as an expert in photography, motion pictures, mimeographing, and ingenious setups for mechanical and physiological demonstrations, the author has brought his manual to mature perfection. It impresses us as the best organized, arranged, and balanced laboratory guide of which we have knowledge.

Though mimeographed, the mechanical work goes far beyond the

Background for the Microscope

Equipment for the pursuit of microscopy may be as simple or as elaborate as individual inclinations dictate; but there is one item wholly indispensable —*books!* The microscope is handmaiden to all the sciences, and those who follow its adventuresome trail must have many a guide to direct along the right path.

Here is NATURE MAGAZINE'S selection of best bets. Check your library and add those who fail to answer the roll call. Buy one each month, or as often as you can. Suggest them as gifts. Buy them for the relative or friend whose chief joy is working with his microscope. Entries will be changed periodically; here is a basic list for a starter:—

MICROSCOPE

The Microscope, by S. H. Gage; 17th ed., most celebrated American work; very thorough.....$4.00

The Microscope, by R. M. Allen; Excellent new manual.....$3.00

MICROTECHNIQUE

Working with the Microscope, by J. D. Corrington; New guide for self help or classroom with graded series of lessons, from single to advanced. $3.50

Adventures with the Microscope, by J. D. Corrington; An informative and interesting text for the younger hobbiest or biological student.....$5.00

Animal Micrology, by M. F. Guyer; Best general guide for histology and zoology at the college level.....$2.50

The Microtomist's Vade-Mecum, by A. B. Lee; Encyclopaedic reference, standard, advanced; botany and zoology. $9.00

PHOTOMICROGRAPHY

Photomicrography, by R. M. Allen; Splendid new work by recognized authority; complete; fully illustrated. $5.50

BOTANY

Textbook of Botany, by Transeau-Sampson-Tiffany. Beautifully designed, readable, recent.....$4.00

ZOOLOGY

College Zoology, by R. W. Hegner. Fifth Edition; most successful work of its kind; gives all main animal types and their structure.....$3.75

Animals Without Backbones, by R. Buchsbaum. Fascinatingly written and illustrated; new style invertebrate zoology.....$5.00

Man and the Vertebrates, by A. S. Romer. Companion volume to preceding; excellent general survey. $4.50

ORDER FROM

MICROBOOK DEPARTMENT
NATURE MAGAZINE
1214 Sixteenth St., N.W.
Washington, D. C.

best achievements of most persons who think they understand this art, and compares equally with the best multigraphing or lithoprinting. The many large illustrations are splendidly done, often in two colors. Experimental work is stressed, there are tables to fill, questions to answer, drawings to make in entirety, drawings partly made, with detail to be added, drawings fully made and needing only labeling. Many teaching devices are unique: an outline sketch of a lilac leaf has label lines running from layers to instructions, instead of to labels, as "note the thickness of the cuticle here," "examine a small vein," "look for the cambium." A series of ten close-up photographs shows manipulations of the microscope; the table of contents is in blank, to be filled in as the work progresses.

The student uses material from elementary to advanced; from routine slides to serial sections; with ordinary microscopes and also with oil immersion or other advanced accessories; he makes a crude extract of chlorophyll, then uses a spectroscope to observe and draw the absorption bands. He sometimes prepares his own material, and on occasion must key out unknowns before working with them. Part I, 131 pages and some 80 illustrations, covers in very thorough fashion the morphological, physiological, and taxonomic exercises of the first semester; the microscope, plant products, cells, leaves, tree identification, physiology, roots, soils, stems, flowers, reproduction, development, and germination. Part 2, for the second semester, surveying plant groups, contains 111 pages and 32 illustrations. Syracuse University Book Store, 303 University Place, Syracuse, N. Y., 1941. $1.25 per volume.

Farthest removed from the classical conception of what a laboratory manual should be is Professor H. C. Sampson's (Ohio State University) *Work Book in General Botany*, a compendius volume of vi, 242 lithoprinted pages, copiously illustrated with line drawings, photographs, photomicrographs, graphs, keys, tables, charts, review problems, and references.

The book is a laboratory guide plus; a real work book in which the student can bring together information from a wide variety of sources on specific problems in botany. The approach is to supplement observations and experiments with discussions, and with inferences to be drawn from data. A large number of complete and fully labeled drawings, associated by most teachers with a text rather than a laboratory manual, are included for comparisons, reference, and completion of topics. Other drawings await merely labeling by the student, and very few original drawings are called for, this method having gone by the board almost completely.

A novel feature is the emphasis on variation and heredity. These sections, together with the ones on the chemistry of plant metabolism, appear to us very advanced for a beginning course. Only one-sixth of the volume is concerned with a survey of plant forms. However, it would seem that the student who can pursue this course successfully, and who assimilates the spirit of inquiry and the critical attitude so continually stressed, will indeed have mastered both the facts and the methods of a modern science. Harper and Brothers, 49 E. 33d St., New York, 1941. $1.75.

PRIZE WORD ACROSTIC

One year's membership in the American Nature Association, including subscription to NATURE MAGAZINE, and a year's membership in the American Society of Amateur Microscopists, will be awarded the author of the first complete and correct solution received for the following acrostic. Contributions will not be acknowledged, but the solution and name of the winner will appear in the next issue. Address Dr. Julian D. Corrington, 118 Water St., Chestertown, Md.

My first is an act that makes trifles appear
Of enormous proportion and very severe.
My second is what an iconoclast hates,
My third is a task every teacher relates
To work as submitted and as it should be.
My fourth, January the second will see
Completely demolished. My fifth is the aim
Of purposeful action; my sixth is the same,
Or so says the poet, as all of the earth.
My seventh has proved of inestimable worth
In telephones, radios, autos, and such,
By increasing the juice they may store very much.
My eighth is a method of proving, without
Ears, nose, tongue, or fingers; yet still beyond doubt.
My ninth is observed, though not consciously seen,
When watching Veronica Lake on the screen.
My last is that part of a needle, 'tis said,
That camels eschew though they've two in their head.
Ten single words;—things are or things done;
A decade of terms all applying to one:
Ten single words, whose initials will spell
An object each microfan loves very well.

AIR BUBBLES IN BALSAM

Beginners are frequently annoyed by large air bubbles in their finished balsam mounts. Small bubbles, or those not overlying any of the subject, may be ignored, and bubbles that are already in contact with the exterior will usually work out by themselves. However, treatment is called for in the case of bubbles remaining when the balsam has solidified and which obscure part of the material.

Warm the slide on a hot plate to melt the balsam, then heat a fine needle to the same degree and run it in slowly between slide and cover so as to prick the bubble and give a channel of escape to the outside. Avoid having the needle too hot; it will crack the cover glass. Hold the slide on a slant with the needle inserted at the top; this aids escape of the trapped air. It is usually necessary also to apply at this time a small drop of fresh balsam around the needle entrance. As the air passes out the balsam will flow in.

Best practice is to avoid bubbles in the first place. Always keep the balsam bottle capped except at the moment of use, and do not needlessly keep removing and replacing the applicator rod; let the balsam alone as much as possible. When adding fresh xylene to thin the balsam, stir very slowly and carefully, without lifting the applicator rod up and down, so as not to whip in air bubbles. A mass so viscous and heavy as balsam traps air easily and holds minute bubbles for a long time. In applying the balsam do not let it fall on the material from a height; hold the rod close to the specimen. Add the cover glass gently, holding it on a slant, one edge touching the slide just beyond the preparation. Let it fall easily so that a wave of contact between glass and balsam passes across the cover, driving the air before it.

TRADE NOTES

Those interested in the biology of microscopic organisms should not miss the December, 1941, issue of *Natural History*. Dr. Roy Waldo Miner writes on the *Universe Through a Microscope: The Protozoa*, and the article is illustrated by twenty superb photographs, eighteen of which are of the celebrated enlarged blown glass models of microorganisms made by Herman Mueller. The photographs are by Charles H. Coles. All three men are members of the staff of the American Museum of Natural History in New York.